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2018 Hazardous Substance Review Project
Ontario Ministry of Labour
12th Floor, 400 University Avenue
Toronto, ON M7A 1T7

Dear Honorable Minister of Labour,

Thank you for opening a public consultation on the *Proposed Changes Affecting the Protection of Workers from Exposures to Hazardous Biological or Chemical Agents under the Occupational Health and Safety Act.* The Occupational Cancer Research Centre (OCRC) is dedicated to the study and prevention of occupational cancer, and supports occupational exposure limits for carcinogens that are rigorous, current, and reflect the best possible standards for workers. We enclose support for a number of the Ministry's proposed changes, as well as further recommendations to protect the health of workers.

Diesel Engine Exhaust

Approximately 301,000 Ontarians are exposed to diesel engine exhaust at work.[1] OCRC estimates that approximately 2.1 percent of lung cancer cases (170 cases) diagnosed annually in Ontario are from occupational exposure to diesel engine exhaust.[2] OCRC therefore supports the Ministry's proposed introduction of an occupational exposure limit (OEL) for diesel particulate matter of 160 µg/m^3 (total carbon) into Regulation 833. We applaud this initial step, which makes Ontario one of the few jurisdictions to introduce an OEL for diesel particulate matter applicable outside of the mining industry. We also recommend that in conjunction with the introduction of an OEL into Reg. 833, the limit set in Reg. 854 (currently 400 µg/m^3 total carbon) be simultaneously lowered to 160 µg/m^3.

While this is a promising first step, current evidence indicates that to adequately protect workers' health, these limits should be set much lower. Moving forward, OCRC recommends further lowering the diesel engine exhaust OELs in both Reg. 833 and 854 to more protective levels, and moving to a standard based on elemental carbon measurement. Elemental carbon is a more specific measure of diesel particulate matter than total carbon, which can be confounded by cigarette smoke or other combustion products.[3] Total carbon levels can be roughly estimated from measures of elemental carbon by multiplying by a factor of 1.27, thus 160 µg/m^3 total carbon is roughly equivalent to 126 µg/m^3 elemental carbon.[4] Based on evidence of increased lung cancer risk at very low levels,[5] OCRC recommends moving towards a limit of 20 µg/m^3 (elemental carbon) for the mining industry and 5 µg/m3 (elemental carbon) for other workplaces. Other groups are recommending similar or even more protective limits: in 2017, the Dutch Expert Committee on Occupational Safety of the Health Council of the Netherlands recommended a health-based OEL for diesel engine exhaust of no higher than background levels (approximately 1 µg/m^3).[6]

We do not foresee implementation challenges to the proposed changes. In the United States, mines have been required to meet the limit of 160 µg/m3 (total carbon) since 2008, and diesel exhaust levels in non-mining industries are generally much lower. Exposure levels for truck, bus and taxi drivers generally range from 1 to 10 µg/m^3 elemental carbon (approximately 1.3 to 13 µg/m^3 total carbon), while mechanics are exposed to approximately 20 to 40 µg/m^3 elemental carbon (approximately 25 to 51 µg/m^3 total carbon).[2] This is a feasible first step in controlling exposure to diesel exhaust.

Formaldehyde, Toluene Diisocyanate and Cobalt

OCRC supports the proposed changes to the OELs for formaldehyde, toluene diisocyanate (TDI) and cobalt metal with tungsten carbide. Formaldehyde exposure causes nasopharyngeal cancer, leukemia, asthma and contact dermatitis.[7] Exposure to TDI causes asthma and skin and respiratory sensitization.[8] Cobalt metal with tungsten carbide is a probable human carcinogen (IARC Group 2A) and is linked to asthma, lung disease, and allergic dermatitis.[9] The proposed changes to these OELs will help reduce exposure and protect workers' health.

Unusual Work Schedules

We also applaud the Ministry's decision to adopt the IRSST's *Guide for the adjustment of permissible exposure values (PEVs) for unusual work schedules* to calculate exposures over irregular work shifts. This method will help to ensure that workers with irregular work schedules are protected to the same level as those working a conventional shift schedule.

Future Considerations

We enclose further recommendations where we believe reductions to the current OELs are necessary (see attached Table). Silica, nickel, chromium (VI) and wood dust are all known carcinogens affecting Ontario workers. They are also associated with other occupational diseases, such as silicosis and chronic obstructive pulmonary disease (silica), allergic contact dermatitis (nickel and chromium), and asthma (wood dust).[9] Bringing Ontario OELs into alignment with more health-based, protective limits in other jurisdictions will help reduce both cancer and other occupational disease in Ontario.

Finally, we recommend that the Ministry of Labour review and update the regulations for welding fumes within Reg. 833. In 2017, the International Agency for Research on Cancer upgraded the classification of welding fumes to Group 1, a known carcinogen, based on an observed relationship with lung cancer.[10] In Ontario, approximately 1.3 percent of lung cancer cases (100 cases) diagnosed annually are due to occupational exposure to welding fumes.[2] Currently, there is no OEL specific to welding fumes in Ontario; the mixture is regulated as its constituent metals and particulates. As welding fumes are now a confirmed lung carcinogen, this approach is not appropriate and a specific OEL should be adopted.

Thank you for considering our submission.

Sincerely,

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Recommendations

Substance	Number of Ontario workers exposed	Number of cancers per year (Ontario)	Current OEL (TWA unless otherwise noted)	Recommended OELs (source/jurisdiction)
Chromium (VI)	39,000	25 lung	Water-soluble Cr VI compounds: 0.05 mg/m^3 Insoluble Cr VI compounds: 0.01 mg/m^3	Soluble compounds: 0.025 mg/m^3 (ceiling limit 0.1 mg/m^3) Insoluble compounds: 0.01 mg/m^3 *(British Columbia)*
Diesel engine exhaust	301,000	170 lung 45 bladder (suspected)	Mining: 400 µg/m^3 (TC) Other industries: None Proposed (all industries): 160 µg/m^3 (TC)	Mining: 20 µg/m^3 (EC) Other industries: 5 µg/m^3 (EC) *(Finnish Institute for Occupational Health)*
Nickel	48,000	80 lung	Elemental/metal: 1 mg/m^3 (I) Insoluble compounds, as Ni: 0.2 mg/m^3 (I) Soluble compounds, as Ni: 0.1 mg/m^3 (I) Nickel subsulfide, as Ni: 0.1 mg/m^3 (I)	Elemental: 0.05 mg/m^3 Insoluble compounds: 0.05 mg/m^3 Soluble compounds: 0.05 mg/m^3 Nickel subsulfide: 0.1 mg/m^3 *(British Columbia)*
Silica	142,000	200 lung	Quartz/Tripoli: 0.10 mg/m^3 (R) Cristobalite: 0.05 mg/m^3 (R)	Quartz: 0.025 mg/m^3 (R) Cristobalite: 0.025 mg/m^3 (R) *(ACGIH, majority of Canada)*
Welding fumes	169,000 (including those performing occasional welding)	100 lung	Particles (insoluble or poorly soluble) not otherwise specified: 10 mg/m^3 (I) or 3 mg/m^3 (R) Aluminum metal insoluble compounds: 1 mg/m^3 (R) Iron oxide: 5 mg/m^3 (R) *And various other individual metals*	Adopt a specific OEL for welding fumes.
Wood dust	92,000	<5 sinonasal <5 nasopharyngeal	Certain hardwoods as beech and oak: 1 mg/m^3 Softwood: 5 mg/m^3 (STEL 10 mg/m3)	All non-allergenic species: 1 mg/m^3 (I) Western red cedar (allergenic): 0.5 mg/m^3 (I) *(ACGIH)*

TC total carbon; EC elemental carbon; R respirable fraction; I inhalable fraction; ACGIH American Conference of Governmental Industrial Hygienists

References

1. CAREX Canada. Data outputs from eWORK tool [Version 1.0, 2014]. Available from www.carexcanada.ca.
2. Cancer Care Ontario, Occupational Cancer Research Centre. *Burden of occupational cancer in Ontario: Major workplace carcinogens and prevention of exposure.* Toronto: Queen's Printer for Ontario; 2017. Available from http://www.occupationalcancer.ca/2017/occupational-burden-ontario-report/.
3. HEI Diesel Epidemiology Panel (2015). Diesel emissions and lung cancer: An evaluation of recent epidemiological evidence for quantitative risk assessment. Special Report 19. Boston, MA: Health Effects Institute. Available from https://www.healtheffects.org/publication/diesel-emissions-and-lung-cancer-evaluation-recent-epidemiological-evidence-quantitative.
4. Noll J, Gilles S, Wu HW, Rubinstein E. The relationship between elemental carbon and diesel particulate matter in underground metal/non-metal mines in the United States and coal mines in Australia. J Occup Environ Hyg 2015;12(3):205-211. Available from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4487601/.
5. Vermeulen R, Silverman DT, Garshick E, Vlaanderen J, Portengen L, Steenland K. Exposure-response estimates for diesel engine exhaust and lung cancer mortality based on data from three occupational cohorts. Environ Health Perspect 2014;122:172-177. Available from https://ehp.niehs.nih.gov/1306880/#tab1.
6. Dutch Expert Committee on Occupational Safety (DECOS). Diesel Engine Exhaust: Health-based recommended occupational exposure limit (draft for public review). 2017. Available from https://www.gezondheidsraad.nl/en/news/draft-advisory-report-for-public-review-diesel-engine-exhaust.
7. International Agency for Research on Cancer (IARC). Monograph 100F: Chemical Agents and Related Occupations. 2012. Available from http://monographs.iarc.fr/ENG/Monographs/vol100F/index.php.
8. Toxicology Data Network (TOXNET). Hazardous Substances Data Bank (search term: 'toluene diisocyanate'). Available from https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.
9. CAREX Canada. Carcinogen Profiles. 2016. Available from https://www.carexcanada.ca/en/profiles_and_estimates/.
10. International Agency for Research on Cancer (IARC). Carcinogenicity of welding, molybdenum trioxide, and indium tin oxide. Lancet Oncology 2017;18:581-582. Available from http://www.thelancet.com/pdfs/journals/lanonc/PIIS1470-2045(17)30255-3.pdf.

About OCRC

OCRC is an applied research program for the study and prevention of cancers caused by work. The Centre builds scientific knowledge of occupational cancer through three broad categories of research: surveillance research to identify the industries, occupations, and workers where the risks of cancer are the highest; epidemiologic research to identify the causes of cancer in the workplace; and prevention research to identify and apply the most effective interventions to reduce exposure to workplace carcinogens.