

Priority Occupational Carcinogens for Surveillance in Canada:

Preliminary Priority List

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Executive Summary

What is the purpose of this report?

The main objectives of CAREX Canada are to identify the number of Canadians exposed to workplace carcinogens, to determine at what levels potential exposure may occur, and to ascertain the extent of any geographic variations. This is an enormous task. Roughly half of the known, probable, and possible carcinogens in the International Agency for Research on Cancer's (IARC's) classifications are either principally occupational or the highest levels of exposure occur under these circumstances. In order to organize this task, a prioritization process is necessary.

How did we prioritize the carcinogens?

The prioritization exercise was undertaken in four steps:

1. Carcinogens were first broadly categorized according to their potential for human exposure *in the workplace*. If exposure were unlikely to occur in the workplace, substances were excluded from further consideration. The remaining substances were selected for critical review.
2. For substances selected for critical review, CAREX Canada staff collected key information on characteristics and overall toxicity, potential exposure circumstances, and evidence for exposure in Canadian workplaces.
3. Tables summarizing key information for each substance were then generated. Each substance was considered in light of three criteria:
 - i. carcinogenicity and other toxic properties
 - ii. prevalence of exposure in Canada, and
 - iii. feasibility of assessing exposure
4. On the basis of these criteria, substances were then placed into one of four groups:
 - A. Immediate high priority substances
 - B. Possible high priority substances
 - C. Moderate priority - further substantial investigation warranted
 - D. Low priority - no evidence of use in Canada

Some examples of the types of data sources consulted are the U.S. National Toxicology Program (NTP) Report on Carcinogens, the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles, Health Canada's categorization of the Domestic Substances List, and the Canadian Environmental Protection Act (CEPA) priority substances lists and risk assessment information. Many other specialized searches targeted at assessing the potential for use and exposure in Canada were also undertaken for each reviewed substance.

What did we find?

A total of 417 IARC known or suspected carcinogens were initially considered for inclusion. After the relevant exclusions, a total of 229 substances remained for critical review. Of the 229 substances chosen for critical review, 44 were IARC Group 1 carcinogens, 44 were IARC Group 2A carcinogens, 138 IARC Group 2B carcinogens, and 3 were mixed categories of carcinogens. When grouped on the basis of use, the 229 substances fell into the following categories: industrial chemicals (142), pesticides (27), metals (13), pharmacologic (23), fibres and dusts (8), microbiologic (3), radiation (4), hormones (4), and other (5).

After prioritization, 53 substances were placed in Group A (Immediate high priority), 61 in Group B, 37 in Group C, and 78 in Group D.

What are the next steps?

First, we will send out the results of this prioritization to previously identified experts to ensure transparency in process as well as to obtain advice on current Canadian usage for substances where information was lacking. At this stage, the priorities we have set are open to adjustment, and we will consider adding or removing substances based on new information or expert advice.

The majority of our work over the next year will focus on the Group A high priority substances and mixtures. We have begun to establish contact with relevant experts and organizations that may hold occupational exposure data that would be pertinent for CAREX Canada's workplace exposure database. For the other priority groups, we will need to collect more information on current usage in Canada from experts in various industries and academic specialties. Group B includes many substances that are used in Canada, but for which it may not be as feasible to develop robust estimates of exposure. Group C substances require further substantial research into current use in Canada. For many of these substances, we found evidence of use in industries that exist in Canada, but no specific reference to the particular chemical. Group D includes substances that are not expected to be used in Canadian workplaces. Our intent is to move substances from Groups B and C either up or down in priority (i.e. into high priority or low priority categories) based on advice gathered during expert review of the prioritization.

This prioritization gives us an important starting point to begin accessing occupational exposure data in the Canadian context. Our ultimate goals are to produce robust estimates of the number of Canadians exposed to carcinogens in their workplaces, determine at what levels exposure occurs by industry and occupational group, and if exposure levels vary geographically or within population sub-groups. These exposure surveillance results will be important for many purposes, including targeting population groups at high risk of developing cancer for preventative interventions, and identifying research priorities, knowledge gaps and future needs for carcinogen surveillance in Canada.

Introduction

The identification and classification of carcinogens plays a key role in cancer prevention, from labeling to prohibition of exposure. Canada does not have an independent program for classifying substances as to their carcinogenicity. Instead, it relies on agencies outside of Canada, most commonly the International Agency for Research on Cancer (IARC). IARC is a specialized United Nations agency attached to the World Health Organization which is funded directly by the industrialized countries, including Canada. Its program to evaluate carcinogens was initiated in 1971 and uses expert groups to classify potential carcinogens or exposure circumstances¹ into five categories:

- | | |
|----------|--|
| Group 1 | Carcinogenic to Humans |
| Group 2A | Probably Carcinogenic to Humans |
| Group 2B | Possibly Carcinogenic to Humans |
| Group 3 | Not classifiable as to its Carcinogenicity to Humans |
| Group 4 | Probably Not Carcinogenic to Humans |

Group 1 includes substances with either strong epidemiologic evidence or extremely strong experimental evidence. At the time this report was prepared, there were 102 Group 1 carcinogens². Group 2A primarily consists of substances with good experimental evidence and limited or inconsistent epidemiologic evidence. There are currently 69 Group 2A carcinogens³. Group 2B primarily consists of animal carcinogens with little or no human evidence. There are currently 246 Category 2B carcinogens⁴. A complete list of all IARC Group, 2A, and 2B carcinogens is included in Appendix A. Group 3 is considered the neutral category in IARC evaluations. It currently consists of 516 substances or exposure circumstances for which there was inadequate data to classify as either an animal or human carcinogen. Group 4 has only been used once (for caprolactam) because there must be clear evidence of a negative association (lack of information is not acceptable and would lead to a classification of Group 3) and only substances with some evidence of carcinogenicity are nominated for IARC evaluation.

The main objectives of CAREX Canada (**CAR**cinogen **EX**posure) are to identify the number of Canadians exposed to workplace carcinogens, to determine at what levels potential exposure may occur, and to ascertain the extent of any geographic variations. This is an enormous task. Roughly half of the substances in Categories 1, 2A, and 2B are either principally occupational or the highest levels of exposure occur under these circumstances. In order to organize this task, a prioritization process is necessary. This paper will present the results of a preliminary prioritization exercise carried out by CAREX Canada staff to identify known and suspected carcinogens for immediate surveillance efforts, as well as others that may be added in the future. In this report we describe the methods that were used to prioritize the substances and the data sources that were consulted.

¹ Exposure circumstances are reviewed by IARC when excesses among well-defined populations have been observed, but the potential carcinogen has not been identified. Such an evaluation usually prompts further research and subsequent evaluations generally focus on specific substances.

² Includes many well known occupational carcinogens, such as asbestos, radon, and environmental tobacco smoke.

³ Includes substances such as tetrachloroethylene, diesel engine exhaust, and specific forms of UV radiation.

⁴ Includes substances such as DDT, styrene, and refractory ceramic fibres, an asbestos substitute.

Methods

The prioritization exercise was undertaken in four steps:

1. Carcinogens were first broadly categorized according to their potential for human exposure *in the workplace*. If exposure were unlikely to occur in the workplace, substances were excluded from further consideration. The remaining substances were selected for critical review.
2. For substances selected for critical review, CAREX Canada staff collected key information on characteristics and overall toxicity, potential exposure circumstances⁵, and evidence for exposure in Canadian workplaces.
3. Tables summarizing key information for each substance were then generated. Each substance was considered in light of three criteria:
 - a. carcinogenicity and other toxic properties
 - b. prevalence of exposure in Canada, and
 - c. feasibility of assessing exposure
4. On the basis of these three criteria, substances were then placed into one of four groups:
 - a. Immediate high priority substances
 - b. Possible high priority substances
 - c. Moderate priority - further substantial investigation warranted
 - d. Low priority - no evidence of use in Canada

The general prioritization process is illustrated schematically in Figure 1.

Initial Categorization of Carcinogens and Exclusions

A review of the IARC monographs was undertaken and substances were first placed into broad categories based on their potential for human exposure. The following substances or exposure circumstances were excluded because exposures were either primarily non-occupational or the highest exposures were likely to occur in other settings (at least in Canada):

- naturally occurring dietary exposures
- most microbiological agents, except for 2 infectious agents with potential for exposure to healthcare workers
- most hormones with the exception of 5 (which were collapsed into 3 groups) where we anticipated potential occupational exposures to certain health care workers
- all pharmacologic agents on the IARC 2B list⁶

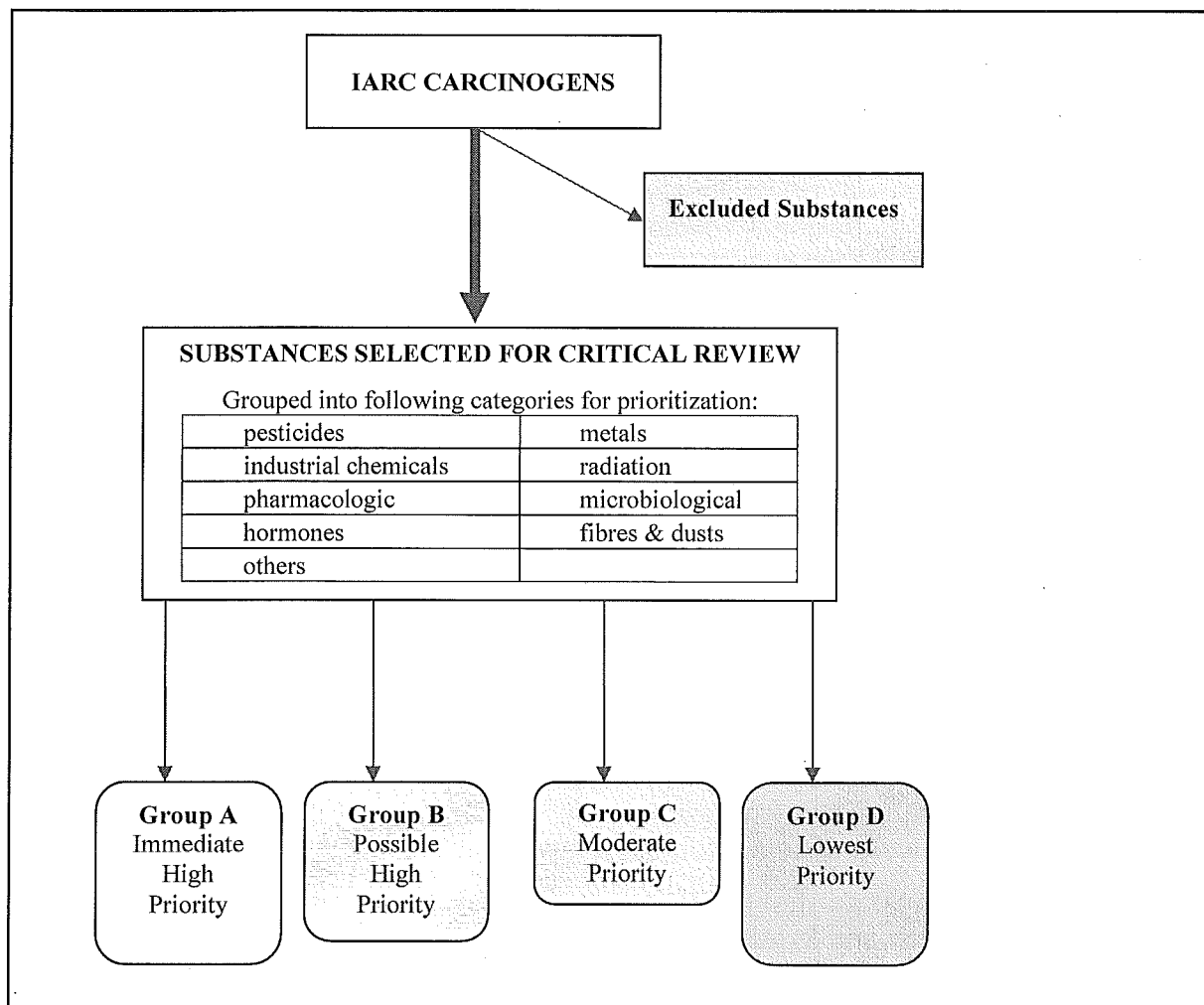
In addition, all occupational exposure circumstances⁷, except for strong inorganic mists containing sulfuric acid and shift work were excluded because of their limited utility for prevention.

⁵ Settings or activities in which humans may be exposed.

⁶ We intend to enlist expert assistance to select the most relevant pharmacologic agents for inclusion in our review over the next year.

⁷ Most were excluded because they were workplaces where exposures of interest had already been evaluated.

Figure 1: General Schematic of the Prioritization Process



IARC monographs may address either individual substances or general groups of substances. Therefore, some adjustments have been made to the original IARC lists for the purposes of preliminary prioritization. In some cases, substances reviewed individually by IARC have been grouped for prioritization; while in others, substances considered as a group by IARC have been treated as individual substances for prioritization. The polycyclic aromatic hydrocarbons (PAH) are an example of individual IARC substances that we considered as a group for prioritization. While it is possible in a laboratory setting to examine the carcinogenicity of a singular PAH, in reality humans are exposed to a complex mixture and estimating exposure for any one compound would be impossible and not useful for prevention purposes. Some PAHs have been evaluated separately though (i.e. coal-tars, naphthalene) because they have commercial applications as well as being combustion products. The chlorophenoxy herbicides are an example of an IARC group that we broke down into individual substances for the purposes of prioritization. IARC grouped 6 pesticides (2,4-D, 2,4-DP, 2,4,5-T, MCPA, MCPP, and Silvex) into one monograph because they are chemically similar, but the pesticides vary widely in their usage (from being banned to being one of the most commonly used in Canada). It therefore makes more sense to examine each one individually.

Data used for Prioritization

For preliminary prioritization, we collected information on the characteristics and overall toxicity of the substance, potential exposure circumstances, and evidence for exposure in Canadian workplaces. To aid in data collection, synonyms and Chemical Abstract (CAS) numbers were identified, when appropriate.

Toxicity information was primarily abstracted from the large systematic reviews conducted by IARC, the U.S. National Toxicology Program (NTP) Report on Carcinogens, and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles. In addition, Health Canada's Domestic Substances List and the Canadian Environmental Protection Act (CEPA) priority lists and supporting documents were also consulted to assess federal priority, as well as previous efforts to assess exposure among Canadians.

The large systematic reviews conducted by IARC, NTP, and ATSDR were also reviewed to identify potential occupational exposure circumstances. We define exposure circumstances as settings or activities where human exposure may occur. In the workplace these are typically industries or specific work activities. For chemical exposures they may also identify potential pathways for exposure (i.e. through inhalation or dermal absorption). These exposure circumstances may have been identified in Canada or in another country, most typically the United States, where current and historical use or production would be similar to Canada.

For the selected substances, a number of search strategies were employed to gather information regarding specific use and evidence for exposure in Canadian workplaces. Examples of our search strategies are set out below.

- Whenever possible, production (or mining in the case of metals or minerals), sales, import, or export were documented using government sources.
- The material safety data sheet database maintained by the Canadian Centre for Occupational Health and Safety was searched to identify commercial products. The U.S. Household Products database was also consulted (on the assumption that consumer products are similar in Canada).
- The database of allowed pesticides maintained by the Canadian Pesticide Management Regulatory Agency was searched.
- The databases of the Ontario Ministry of Labour and Worksafe BC, as well as reports for 2001 through 2005 from the Quebec Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST), were used to document workplace exposure.
- CAREX Canada estimates were used for the 1 and 2A and the few 2B substances included in that project. The National Pollution Release Inventory was also searched.

The goal was to cast a broad net in collecting information for each chemical and then to produce simplified tables with the most important information sources included.

Additional details regarding the resources used can be found in Appendix B. During the information gathering process, a Wiki with a structured page was created for each carcinogen or suspected carcinogen under review. This allowed multiple researchers to post information in a place accessible to all regarding occupational (as well as environmental) exposure identified and notes for future searches. To aid in the review, some of this data has been summarized in one to two page "fact sheets" for each substance.

Preliminary Prioritization

Tables were then created in which some of the key information for each substance was summarized under the following subheadings: 'Carcinogenicity and Toxicity', 'Potential exposure circumstances', and 'Evidence of use/exposure in Canada'. A summary table of key information used in the prioritization process (by category and in alphabetical order) is included as Appendix C.

For the prioritization, three criteria were considered:

1. The carcinogenicity and other toxic properties of the substance
2. The prevalence of exposure in Canada
3. The feasibility of assessing exposure

These three criteria were used to place each substance into one of four groups: immediate high priority, possible high priority, moderate priority and low priority.

Group A - Immediate High Priority

This group consists of substances that ranked high based on all three criteria. It consists primarily of IARC 1 or 2A carcinogens or of a group that would logically fall there⁸. Also included in this group are 2B carcinogens with other, well-established toxic effects, as well as common pesticides. All substances in this group have clear evidence for common exposure in Canadian workplaces. Although precise estimates are not possible at this time, we would anticipate at least 10,000 workers exposed at some level. Substances in this category are all considered feasible for assessment at both the industry and provincial level. For most there is a substantial amount of measurement data available or exposure is known to occur among well-defined groups that are identifiable using Census data. Many of these were previously evaluated in the CAREX Canada project.

Group B - Possible High Priority

This group consists of substances that are in need of further assessment regarding the prevalence of exposure in Canada or the feasibility of assessment. Although exposure to these substances is known to occur in Canada, it was either difficult to assess whether these exposures are common or unclear whether it would be feasible to assess exposure. Many IARC 2B substances are considered in this category.

Group C - Moderate Priority

This group consists of substances that are in need of substantial further investigation. Many may be used in industries that are known to exist in Canada, but specific reference to their use was not found.

Group D - Lowest Priority

This group consists of substances that are not currently under consideration by the project because we can find no evidence for use in Canada. It includes some substances that are banned or heavily restricted in use and others that may be very rare or impossible to meaningfully assess exposures.

⁸ For example, Polycyclic Aromatic Hydrocarbons (PAHs).

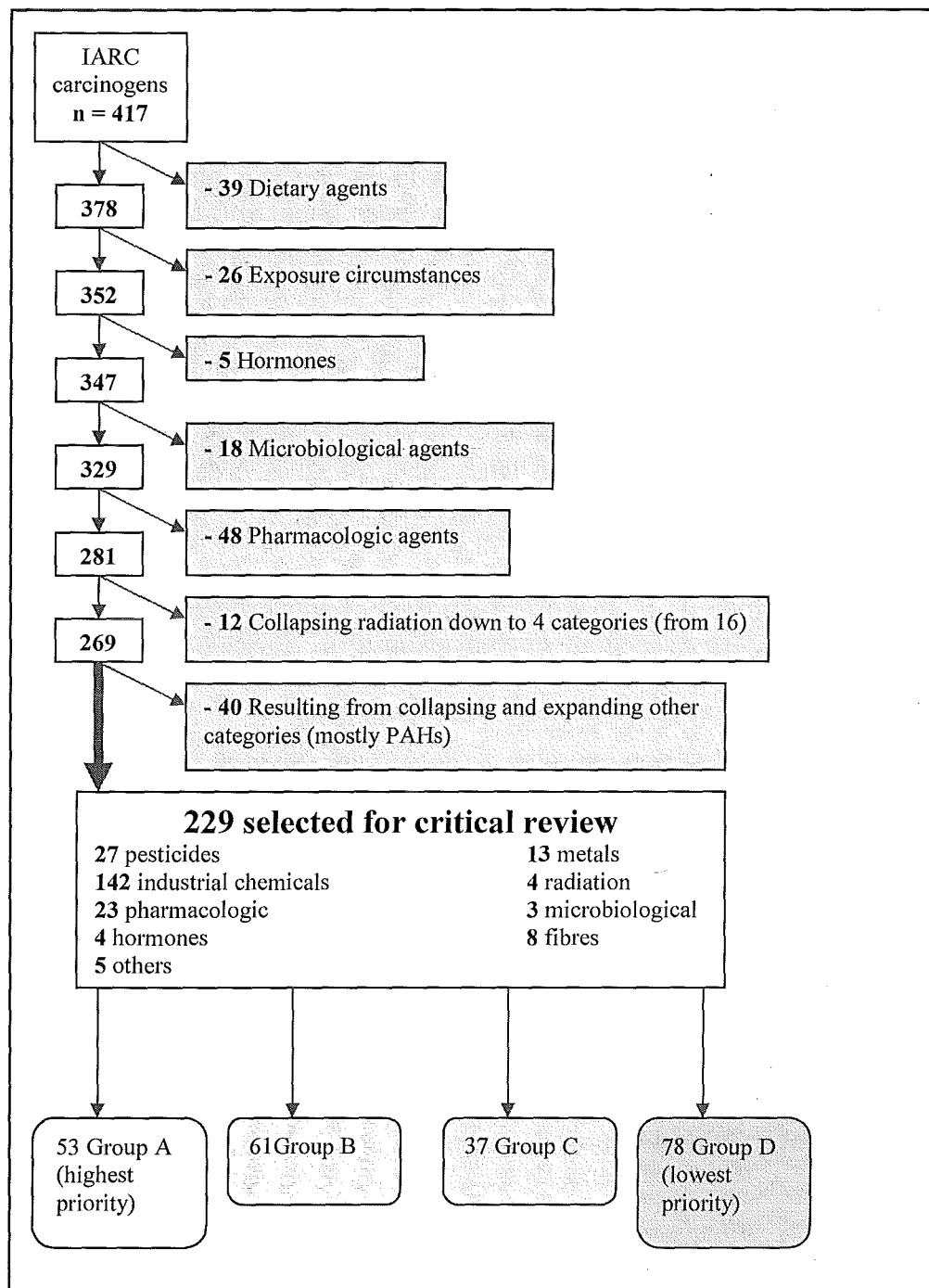
Results

Figure 2 shows a schematic of the overall prioritization process. As shown, a total of 417 IARC known or suspected carcinogens were initially considered for inclusion. After the relevant exclusions, a total of 229 substances remained for critical review. Excluded substances are listed in Table 1 and are grouped into the following categories: dietary agents, exposure circumstances, hormones, microbiological agents and pharmaceuticals.

Of the 229 substances chosen for critical review, 44 were IARC Group 1 carcinogens, 44 were IARC Group 2A carcinogens, 138 were IARC Group 2B carcinogens, and 3 were mixed categories of carcinogens. When grouped on the basis of use, the 229 substances fell into the following categories: industrial chemicals (142), pesticides (27), metals (13), pharmacologic (23), fibres and dusts (8), microbiologic (3), radiation (4), hormones (4), and other (5). Tables with summary information on each of the carcinogens and suspected carcinogens considered are presented in Appendix D.

In general, each chemical was considered on a case-by-case basis for inclusion in priority groups. However, despite the fact there are still feasibility issues to address, some common pesticides were moved into Group A. After prioritization, 53 substances were placed in Group A, 61 in Group B, 37 in Group C, and 78 in Group D. Table 2 lists all substances falling into Groups A, B, and C, while Table 3 lists all those falling into Group D.

Figure 2: Results of the Preliminary Prioritization Process



Discussion

This paper presents a preliminary prioritization of known and suspected carcinogens. Substances falling into Group A will dominate the work of the group for the next year. For substances falling into Groups B, C, and D, efforts will continue to identify evidence for exposure in Canada, as well as to locate data that could be used to assess the number of Canadians exposed and their level of exposure. During the next year, input will also be sought from experts in occupational exposure across Canada to further refine this preliminary prioritization. Based on external input and additional data collected, a final prioritization will be produced in December 2008.

A decision was made not to include workplace environmental tobacco smoke and occupational sun exposure in Group A, even though both would deserve this prioritization. Both sun and tobacco have well-established prevention programs in Canada supported by strong networks and institutions. The same cannot be said for most other exposures considered in this prioritization. This decision could be revisited based on external input. Alternatively, this project could partner with other organizations to produce workplace estimates of exposure for these important causes of cancer.

Because this project was initiated due to concerns regarding cancer prevention, the identification of potential sources of data focused on current exposure. However, all available exposure, including historical, data will be collected or identified as part of this project and will be made available for disease surveillance, research, and other purposes.

The major limitation of this prioritization exercise is that similar data were not available for all substances considered. As a result, it was not possible to use simple, objective criteria to identify priorities. While the review identified some substances that were clearly of high priority and others that were clearly of low priority, many will require further investigation over the next year. Outside input will also be essential to refine this prioritization.

Acknowledgements

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Table 1: Substances excluded from the preliminary prioritization

Dietary agents (n=39)	Exposure circumstances (n=26)	Hormones (n=5)	Pharmaceuticals (n=48)
3-(N-Nitrosomethylamino)propionitrile A-alpha-C AF-2 Alcoholic beverages Areca nut Betel quid with tobacco Betel quid without tobacco Azaserine Bracken fern Butylated hydroxyanisole (BHA) Caffeic acid Cycasin Daunomycin Dihydrosafrole Ethanol in alcoholic beverages Glu-P-1 Glu-P-2 Hot mate IQ Iron-dextran complex Lasiocarpine MeA-alpha-C MeIQ MeIQx Methylazoxymethanol acetate Mitomycin C Monocrotaline Nitrate or nitrite (ingested) NNN & NNK PhIP Safrole Salted fish (Chinese-style) Sterigmatocystin Trp-P-1 Trp-P-2 Carrageenan, degraded Coffee Pickled vegetables Tobacco, smokeless	Carpentry and joinery Cobalt Metals without tungsten carbide Dry cleaning (occupational exposures) Firefighter (occupational exposures) Printing processes (occupational exposures) Textile manufacturing industry (work in) Aluminium production Auramine, manufacture of Boot and shoe manufacture and repair Chimney sweeping Coal gasification Coal-tar distillation Coke production Furniture and cabinet making Haematite mining (underground) with exposure to radon Iron and steel founding Isopropyl alcohol manufacture Magenta, manufacture of Painter (occupational exposure as a) Paving and roofing with coal-tar pitch Rubber industry Art glass, glass containers and pressed ware (manufacture of) Carbon electrode manufacture Hairdresser or barber (occupational exposure as a) Petroleum refining (occupational exposures in) Sunlamps and sunbeds (use of)	Estrogen-progestogen menopausal therapy (combined) Estrogen therapy, postmenopausal Medroxyprogesterone acetate Progestins Progestogen-only contraceptives Microbiological agents (n=18) Aflatoxin M1 Aflatoxins (naturally occurring mixtures of) <i>Clonorchis sinensis</i> Epstein-Barr virus Fumonisin B1 HIV type 1 (infection with) HIV type 2 (infection with) HPV (several types) HPV types 6 and 11 HPV genus beta (some types) Human T-cell lymphotropic virus type I Kaposi's sarcoma herpesvirus/human herpesvirus 8 Microcystin-LR Ochratoxin A Opisthorchis viverrini <i>Schistosoma haematobium</i> <i>Schistosoma japonicum</i> infection Toxins derived from <i>Fusarium moniliforme</i>	2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole Amsacrine Aristolochic acids Azathioprine Bleomycins Dacarbazine Dantron (Chrysazin; 1,8-Dihydroxyanthraquinone) trans-2-[(Dimethylamino)methylimino]-5-[2-(5-nitro-2-furyl)-vinyl]-1,3,4-oxadiazole Ethyl methanesulfonate Etoposide 2-(2-Formylhydrazino)-4-(5-nitro-2-furyl)thiazole Griseofulvin Herbal remedies containing plant species of the genus <i>Aristolochia</i> 1-Hydroxyanthraquinone Merphalan 2-Methylaziridine (Propyleneimine) Methylthiouracil Metronidazole Mitoxantrone 5-(Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolidinone Nafenopin Niridazole 1-[(5-Nitrofurfurylidene)amino]-2-imidazolidinone N-[4-(5-Nitro-2-furyl)-2-thiazolyl]acetamide Nitrogen mustard N-oxide Oxazepam Panfuran S (containing dihydroxymethylfuratrizine) Phenacetin, analgesic mixtures containing Phenacetin Phenazopyridine hydrochloride Phenobarbital Phenolphthalein Phenoxybenzamine hydrochloride Phenytoin Propylthiouracil Riddelliine Streptozotocin Surgical implants and other foreign bodies Tamoxifen Thioacetamide Thiouracil Thorium-232 and its decay products, administered intravenously Trichlormethine (Trimustine hydrochloride) Uracil mustard Zalcitabine Zidovudine (AZT) Talc-based body powder (perineal use of) Teniposide

Table 2: Surveillance Priority Groups for Occupational Carcinogens

Results of the Prioritization					
Group A (n=53)		Group B (n=61)		Group C (Further investigation needed) (n=37)	
Industrial Chemicals 1,2-Dichloroethane 1,3-Butadiene 1,4-Dioxane Acetaldehyde Acrylamide Acrylonitrile Benzene Bitumens Chloroform Coal-tar & coal-tar pitches Creosotes Dichloromethane Epichlorohydrin Ethylbenzene Ethylene oxide Formaldehyde Naphthalene Nitrobenzene Polychlorinated biphenyls Styrene Tetrachloroethylene Toluene diisocyanates Trichloroethylene	Metals Antimony trioxide Arsenic & its compounds Beryllium & its compounds Cadmium & its compounds Chromium, hexavalent Cobalt and its compounds Lead & its compounds Nickel & its compounds Vanadium pentoxide	Industrial Chemicals 1,2-Epoxybutane 1,2,3-Trichloropropane 2-Nitropropane 2,4-Diaminotoluene 2,4-Dinitrotoluene 2,6-Dinitrotoluene 3,3'-Dichlorobenzidine 3,3'-Dimethoxybenzidine 3,3'-Dimethylbenzidine 4,4'-Methylene bis(2-chloroaniline) (MOCA) 4,4'-Methylenedianiline Benzyl chloride Carbon black Carbon tetrachloride Catechol Chlorinated paraffins Chloroprene Diesel fuel, marine Disperse Blue 1 Ethyl acrylate Fuel oils, residual Furan Gasoline Hexachloroethane Hydrazine Isoprene Mineral oils, un- & mildly-treated Nitrilotriacetic acid Nitromethane N-Nitrosodiethanolamine N-Nitrosodiethylamine N-Nitrosodi-n-butylamine N-Nitrosodi-n-propylamine N-Nitrosomorpholine N-Nitrosopiperidine N-Nitrosopyrrolidine o-Anisidine p-Chloroaniline Potassium bromate Propylene oxide Styrene-7,8-oxide Tetrafluoroethylene Vinyl acetate Vinyl chloride	Metals Gallium arsenide Indium phosphide Methylmercury compounds Titanium dioxide Pesticides 1,3-Dichloropropene 2,4-DP Dichlorvos Hexachlorobenzene Lindane p-Dichlorobenzene Sodium o-phenylphenate Fibres & Dusts Special purpose glass fibres Pharmacologic 1,4-Butanediol-dimethanesulfonate 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea Bischloroethyl nitrosourea Procarbazine hydrochloride Microbiological <i>Helicobacter pylori</i> infection	Industrial Chemicals 1,1-Dimethylhydrazine 2,2-bis(Bromomethyl)-propane-1,3-diol 2,6-Dimethylaniline 2-Nitroanisole 4,4'-Diaminodiphenyl ether 4-Vinylcyclohexane 4-Vinylcyclohexane diepoxide Acetamide Benzoyl chloride Chlorendic acid Citrus Red 2 Diethyl sulfate Diglycidyl Resorcinol Ether Diisopropyl sulfate Dimethyl sulfate Ethyl carbamate Glycidaldehyde Glycidol N-Methyl-N-nitrosourea o-Toluidine p-Dimethylaminoazobenzene Phenyl glycidyl ether Tris(2,3-dibromopropyl) phosphate Vinyl bromide	Pesticides Ethylene dibromide Polychlorophenols (except penta) Fibres & Dusts Erionite Palygorskite Talc containing asbestiform fibres Pharmacologic Ciclosporin Thiotepa Microbiological Hepatitis B virus (chronic infection) Hepatitis C virus (chronic infection) Hormones Androgenic steroids Diethylstilbestrol Estrogens (steroidal & non-steroidal) Oral contraceptives (combined or sequential)
	Pesticides 2,4-D Chlorothalonil MCPA MCPP Pentachlorophenol				
	Fibres & Dusts Asbestos Crystalline silica Refractory ceramic fibres Wood dust				
	Pharmacologic Adriamycin Chlorambucil Cisplatin Cyclophosphamide Melphalan				
	Radiation Ionizing radiation & radioactive elements Magnetic fields (extremely low frequency) Radon & its decay products UV radiation, artificial				
	Others PAH's (as a group) Strong inorganic mists containing sulfuric acid Shift work				

Table 3: Carcinogens not prioritized (not used in Canada, or no occupational exposures expected)

Industrial Chemicals (n=51) 1,2-Diethylhydrazine 1,2-Dimethylhydrazine 1,3-Propane sultone 1-Chloro-2-methylpropene 2,3-Dibromopropanol 2,3,7,8-Tetrachlorodibenzo-p-dioxin 2,4-Diaminoanisole 2-Methyl-1-nitroanthraquinone 3,3'-Dichloro-4,4'-diaminodiphenyl ether 3-Chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX) 4-Chloro-ortho-toluidine 4,4'-Methylene bis(2-methylaniline) 4,4'-Thiodianiline 4-Aminobiphenyl 4-Chloro-o-phenylenediamine Auramine Aziridine Benzidine based dyes Benzidine Benzyl violet 4B Bis(chloromethyl)ether and chloromethyl methyl ether b-Butyrolactone b-Propiolactone Bromodichloromethane CI Acid red 114 CI Basic red 9 CI Direct blue 15 Dichloroacetic acid Dimethylcarbamoyl chloride HC Blue No. 1 Hexamethylphosphoramide Magenta Methyl methanesulfonate N-Ethyl-N-nitrosourea N-methyl-N-nitrosourea N-Nitrosodimethylamine N-Nitrosomethylethylamine N,N-Diacetylbenzidine N-Nitrosomethylvinylamine N-Nitrososarcosine o-Aminoazotoluene Oil Orange SS p-Aminoazobenzene p-Cresidine Polybrominated biphenyls Ponceau 3R Ponceau MX Shale-oils Tetranitromethane Trypan blue Vinyl fluoride	Pesticides (n=13) Aramite 1,2 dibromo-3-chloropropane 2,4,5-T DDT Silvex Captafol Chlordane Chlordecone Heptachlor Mirex Nitrofen Sulfallate Toxaphene Pharmacologic (n=12) 1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea 5-Methoxysporalen 8-Methoxysporalen therapy Azacitidine Chloramphenicol Chlorozotocin N-Methyl-N'-nitro-N-nitrosoguanidine Mustard gas MOPP and other chemotherapy, including alkylating agents N,N-Bis(2-chloroethyl)-2-naphthylamine Nitrogen mustard Treosulfan Others (n=2) Involuntary smoking (Environmental tobacco smoke) Solar radiation <i>*Note: Sun and tobacco smoke are important occupational exposures that are targeted by many other prevention initiatives, and therefore not included in this project.</i>
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Appendix A: IARC Carcinogens and Suspected Carcinogens

IARC Human Carcinogens (Group 1)

Category	Agents, groups of agents, mixtures, exposure circumstances (reviewed by IARC)
Combustion Product	Benzo[a]pyrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Household combustion of coal, indoor emissions from (Vol. 95; in preparation)
Combustion Product	Involuntary smoking (exposure to 'environmental' tobacco smoke) (Vol. 83; 2004)
Combustion Product	Soots (Vol. 35, Suppl. 7; 1987)
Combustion Product	Tobacco smoking and tobacco smoke (Vol. 83; 2004)
Dietary	Alcoholic beverages (Vol. 44; 1988)
Dietary	Areca nut (Vol. 85; 2004)
Dietary	Betel quid with tobacco (Vol. 85, 2004)
Dietary	Betel quid without tobacco (Vol. 85; 2004)
Dietary	Ethanol [64-17-5] in alcoholic beverages (Vol. 96, 2007)
Dietary	N'-Nitrosornicotine (NNN) & 4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK) (Vol. 37, Suppl. 7, Vol. 89; in preparation)
Dietary	Salted fish (Chinese-style) (Vol. 56; 1993)
Dietary	Tobacco, smokeless (Vol. 37, Suppl. 7, Vol. 89; in preparation)
Exposure Circumstance	Aluminium production (Vol. 34, Suppl. 7; 1987)
Exposure Circumstance	Auramine, manufacture of (Suppl. 7; 1987)
Exposure Circumstance	Boot and shoe manufacture and repair (Vol. 25, Suppl. 7; 1987)
Exposure Circumstance	Chimney sweeping (Vol. 92; in preparation)
Exposure Circumstance	Coal gasification (Vol. 34, Suppl. 7, Vol. 92; in preparation)
Exposure Circumstance	Coal-tar distillation (Vol. 92; in preparation)
Exposure Circumstance	Coke production (Vol. 34, Suppl. 7, Vol. 92; in preparation)
Exposure Circumstance	Furniture and cabinet making (Vol. 25, Suppl. 7; 1987)
Exposure Circumstance	Haematite mining (underground) with exposure to radon (Vol. 1, Suppl. 7; 1987)
Exposure Circumstance	Iron and steel founding (Vol. 34, Suppl. 7; 1987)
Exposure Circumstance	Isopropyl alcohol manufacture (strong-acid process) (Suppl. 7; 1987)
Exposure Circumstance	Magenta, manufacture of (Vol. 57; 1993)
Exposure Circumstance	Painter (occupational exposure as a) (Vol. 47; 1989)
Exposure Circumstance	Paving and roofing with coal-tar pitch (Vol. 92; in preparation)
Exposure Circumstance	Rubber industry (Vol. 28, Suppl. 7; 1987)
Exposure Circumstance	Strong-inorganic-acid mists containing sulfuric acid (occupational exposure to) (Vol. 54; 1992)
Fibres & Dust	Asbestos (Vol. 14, Suppl. 7; 1987)
Fibres & Dust	Erionite (Vol. 42, Suppl. 7; 1987)
Fibres & Dust	Silica, crystalline (inhaled in the form of quartz or cristobalite from occupational sources) (Vol. 68; 1997)
Fibres & Dust	Talc containing asbestiform fibres (Vol. 42, Suppl. 7; 1987)
Fibres & Dust	Wood dust (Vol. 62; 1995)
Hormone	Diethylstilboestrol (Vol. 21, Suppl. 7; 1987)
Hormone	Estrogen therapy, postmenopausal (Vol. 72; 1999)
Hormone	Estrogen-progestogen menopausal therapy (combined) (Vol. 72, Vol. 91; in preparation)
Hormone	Estrogen-progestogen oral contraceptives (combined) (Vol. 72, Vol. 91; in preparation)
Hormone	Estrogens, nonsteroidal (Suppl. 7; 1987)
Hormone	Estrogens, steroidal (Suppl. 7; 1987)
Hormones	Oral contraceptives, sequential (Suppl. 7; 1987)

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Industrial Chemical	1,3-Butadiene (Vol. 71; 1999)
Industrial Chemical	2,3,7,8-Tetrachlorodibenzo-para-dioxin [1746-01-6] (Vol. 69; 1997)
Industrial Chemical	2-Naphthylamine (Vol. 4, Suppl. 7; 1987)
Industrial Chemical	4-Aminobiphenyl (Vol. 1, Suppl. 7; 1987)
Industrial Chemical	Benzene (Vol. 29, Suppl. 7; 1987)
Industrial Chemical	Benzidine (Vol. 29, Suppl. 7; 1987)
Industrial Chemical	Bis(chloromethyl)ether and chloromethyl methyl ether (technical-grade)(Vol. 4, Suppl. 7; 1987)
Industrial Chemical	Coal-tar pitches (Vol. 35, Suppl. 7; 1987)
Industrial Chemical	Coal-tars (Vol. 35, Suppl. 7; 1987)
Industrial Chemical	Ethylene oxide (Vol. 60; 1994)
Industrial Chemical	Formaldehyde (Vol. 88; in preparation)
Industrial Chemical	Mineral oils, untreated and mildly treated (Vol. 33, Suppl. 7; 1987)
Industrial Chemical	Shale-oils (Vol. 35, Suppl. 7; 1987)
Industrial Chemical	Vinyl chloride (Vol. 19, Suppl. 7; 1987)
Metals	Arsenic and arsenic compounds (Vol. 23, Suppl. 7; 1987)
Metals	Arsenic in drinking-water (Vol. 84; 2004)
Metals	Beryllium and beryllium compounds (Vol. 58; 1993)
Metals	Cadmium and cadmium compounds (Vol. 58; 1993)
Metals	Chromium[VI] (Vol. 49; 1990)
Metals	Gallium arsenide (Vol. 86; 2006)
Metals	Nickel compounds (Vol. 49; 1990)
Microbiological Agents	Aflatoxins (naturally occurring mixtures of) (Vol. 56, Vol. 82; 2002)
Microbiological Agents	Epstein-Barr virus (Vol. 70; 1997)
Microbiological Agents	Helicobacter pylori (infection with) (Vol. 61; 1994)
Microbiological Agents	Hepatitis B virus (chronic infection with) (Vol. 59; 1994)
Microbiological Agents	Hepatitis C virus (chronic infection with) (Vol. 59; 1994)
Microbiological Agents	Human immunodeficiency virus type 1 (infection with) (Vol. 67; 1996)
Microbiological Agents	Human papillomavirus types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59 and 66 (Vol. 64, Vol. 90; in preparation)
Microbiological Agents	Human T-cell lymphotropic virus type I (Vol. 67; 1996)
Microbiological Agents	Opisthorchis viverrini (infection with) (Vol. 61; 1994)
Microbiological Agents	Schistosoma haematobium (infection with) (Vol. 61; 1994)
Pharmacological	1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea (Methyl-CCNU; Semustine) (Suppl. 7; 1987)
Pharmacological	1,4-Butanediol dimethanesulfonate (Busulphan; Myleran) (Vol. 4, Suppl. 7; 1987)
Pharmacological	8-Methoxypsoralen (Methoxsalen) plus ultraviolet A radiation (Vol. 24, Suppl. 7; 1987)
Pharmacological	Azathioprine (Vol. 26, Suppl. 7; 1987)
Pharmacological	Chlorambucil (Vol. 26, Suppl. 7; 1987)
Pharmacological	Ciclosporin (Vol. 50; 1990)
Pharmacological	Cyclophosphamide (Vol. 26, Suppl. 7; 1987)
Pharmacological	Etoposide in combination with cisplatin and bleomycin (Vol. 76; 2000)
Pharmacological	Herbal remedies containing plant species of the genus Aristolochia (Vol. 82; 2002)
Pharmacological	Melphalan (Vol. 9, Suppl. 7; 1987)
Pharmacological	MOPP and other combined chemotherapy including alkylating agents (Suppl. 7; 1987)
Pharmacological	Mustard gas (Sulfur mustard) (Vol. 9, Suppl. 7; 1987)
Pharmacological	N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine) (Vol. 4, Suppl. 7; 1987)
Pharmacological	Phenacetin, analgesic mixtures containing (Suppl. 7; 1987)
Pharmacological	Tamoxifen (Vol. 66; 1996)
Pharmacological	Thiotepa (Vol. 50; 1990)
Pharmacological	Thorium-232 and its decay products, administered intravenously as a

	colloidal dispersion of thorium-232 dioxide (Vol. 78; 2001)
Pharmacological	Treosulfan (Vol. 26, Suppl. 7; 1987)
Radiation	Neutrons (Vol. 75; 2000)
Radiation	Phosphorus-32, as phosphate (Vol. 78; 2001)
Radiation	Plutonium-239 and its decay products (may contain plutonium-240 and other isotopes), as aerosols (Vol. 78; 2001)
Radiation	Radioiodines, short-lived isotopes, including iodine-131, from atomic reactor accidents and nuclear weapons detonation (exposure during childhood) (Vol. 78; 2001)
Radiation	Radionuclides, α -particle-emitting, internally deposited (Vol. 78; 2001)
Radiation	Radionuclides, β -particle-emitting, internally deposited (Vol. 78; 2001)
Radiation	Radium-224 and its decay products (Vol. 78; 2001)
Radiation	Radium-226 and its decay products (Vol. 78; 2001)
Radiation	Radium-228 and its decay products (Vol. 78; 2001)
Radiation	Radon-222 and its decay products (Vol. 43, Vol. 78; 2001)
Radiation	Solar radiation (Vol. 55; 1992)
Radiation	X- and Gamma (g)-Radiation (Vol. 75; 2000)

IARC Probable Human Carcinogens (Group 2A)

Category	Agents, groups of agents, mixtures, exposure circumstances (reviewed by IARC)
Combustion Product	Cyclopenta[cd]pyrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Dibenz[a,h]anthracene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Dibenzo[a,l]pyrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Diesel engine exhaust (Vol. 46; 1989)
Combustion Product	High-temperature frying, emissions from (Vol. 95, in preparation)
Combustion Product	Household combustion of biomass fuel (primarily wood), indoor emissions from (Vol. 95; in preparation)
Dietary	Hot mate (Vol. 51; 1991)
Dietary	IQ (2-Amino-3-methylimidazo[4,5-f]quinoline) (Vol. 56; 1993)
Dietary	Nitrate or nitrite (ingested) under conditions that result in endogenous nitrosation (Vol. 94; in preparation)
Exposure Circumstance	Art glass, glass containers and pressed ware (manufacture of) (Vol. 58; 1993)
Exposure Circumstance	Carbon electrode manufacture (Vol. 92; in preparation)
Exposure Circumstance	Hairdresser or barber (occupational exposure as a) (Vol. 57; 1993)
Exposure Circumstance	Petroleum refining (occupational exposures in) (Vol. 45; 1989)
Exposure Circumstance	Shiftwork that involves circadian disruption (Vol. 98; in preparation)
Exposure Circumstance	Sunlamps and sunbeds (use of) (Vol. 55; 1992)
Hormones	Androgenic (anabolic) steroids (Suppl. 7; 1987)
Industrial Chemical	1,2,3-Trichloropropane (Vol. 63; 1995)
Industrial Chemical	1,2-Dimethylhydrazine (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	4,4'-Methylene bis(2-chloroaniline) (MOCA) (Vol. 57; 1993)
Industrial Chemical	4-Chloro-ortho-toluidine (Vol. 77; 2000)
Industrial Chemical	α -Chlorinated toluenes (benzal chloride, benzotrichloride, benzyl chloride) and benzoyl chloride (combined exposures) (Vol. 29, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Acrylamide (Vol. 60; 1994)
Industrial Chemical	Benzidine-based dyes (Suppl. 7; 1987)
Industrial Chemical	Creosotes (Vol. 35, Suppl. 7, Vol. 92; in preparation)
Industrial Chemical	Diethyl sulfate (Vol. 54, Vol. 71; 1999)
Industrial Chemical	Dimethyl sulfate (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Dimethylcarbamoyl chloride (Vol. 12, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Epichlorohydrin (Vol. 11, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Glycidol (Vol. 77; 2000)

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Industrial Chemical	Methyl methanesulfonate (Vol. 7, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	N-Ethyl-N-nitrosourea (Vol. 17; 1987)
Industrial Chemical	N-Methyl-N-nitrosourea (Vol. 17; 1987)
Industrial Chemical	N-Nitrosodiethylamine (Vol. 17; 1987)
Industrial Chemical	N-Nitrosodimethylamine (Vol. 17; 1987)
Industrial Chemical	<i>ortho</i> -Toluidine (Vol. 77; 2000)
Industrial Chemical	Polychlorinated biphenyls (Vol. 18, Suppl. 7; 1987)
Industrial Chemical	Styrene-7,8-oxide (Vol. 60; 1994)
Industrial Chemical	Tetrachloroethylene (Vol. 63; 1995)
Industrial Chemical	Trichloroethylene (Vol. 63; 1995)
Industrial Chemical	Tris(2,3-dibromopropyl) phosphate (Vol. 20, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Urethane (Vol. 7, Suppl. 7; 1987)
Industrial Chemical	Vinyl bromide (Vol. 39, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Vinyl fluoride (Vol. 63; 1995)
Metals	Cobalt Metals with tungsten carbide (Vol. 86; 2006)
Metals	Indium phosphide (Vol. 86; 2006)
Metals	Lead compounds, inorganic (Vol. 87; 2006)
Microbiological Agents	<i>Clonorchis sinensis</i> (infection with) (Vol. 61; 1994)
Microbiological Agents	Kaposi's sarcoma herpesvirus/human herpesvirus 8 (Vol. 70; 1997)
Pesticides	Captafol (Vol. 53; 1991)
Pesticides	Ethylene dibromide (Vol. 15, Suppl. 7, Vol. 71; 1999)
Pesticides	Non-arsenical insecticides (occupational exposures in spraying and application of) (Vol. 53; 1991)
Pharmacological	1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU) (Vol. 26, Suppl. 7; 1987)
Pharmacological	5-Methoxypsoralen (Vol. 40, Suppl. 7; 1987)
Pharmacological	Adriamycin (Vol. 10, Suppl. 7; 1987)
Pharmacological	Aristolochic acids (naturally occurring mixtures of) (Vol. 82; 2002)
Pharmacological	Azacitidine (Vol. 50; 1990)
Pharmacological	Bischloroethyl nitrosourea (BCNU) (Vol. 26, Suppl. 7; 1987)
Pharmacological	Chloramphenicol (Vol. 50; 1990)
Pharmacological	Chlorozotocin (Vol. 50; 1990)
Pharmacological	Cisplatin (Vol. 26, Suppl. 7; 1987)
Pharmacological	Etoposide (Vol. 76; 2000)
Pharmacological	Nitrogen mustard (Vol. 9, Suppl. 7; 1987)
Pharmacological	N-Methyl-N'-nitro-N-nitrosoguanidine(MNNG) (Vol. 4, Suppl. 7; 1987)
Pharmacological	Phenacetin (Vol. 24, Suppl. 7; 1987)
Pharmacological	Procarbazine hydrochloride (Vol. 26, Suppl. 7; 1987)
Pharmacological	Teniposide (Vol. 76; 2000)
Radiation	Ultraviolet radiation A (Vol. 55; 1992)
Radiation	Ultraviolet radiation B (Vol. 55; 1992)
Radiation	Ultraviolet radiation C (Vol. 55; 1992)

IARC Possible Human Carcinogens (Group 2B)

Category	Agents, groups of agents, mixtures, exposure circumstances (reviewed by IARC)
Combustion Product	1,6-Dinitropyrene (Vol. 46; 1989)
Combustion Product	1,8-Dinitropyrene (Vol. 46; 1989)
Combustion Product	1-Nitropyrene (Vol. 46; 1989)
Combustion Product	2-Nitrofluorene (Vol. 46; 1989)
Combustion Product	4-Nitropyrene (Vol. 46; 1989)
Combustion Product	5-Methylchrysene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	6-Nitrochrysene (Vol. 46; 1989)
Combustion Product	7H-Dibenzo[c,g]carbazole (Vol. 32, Suppl. 7; 1987)

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Combustion Product	Benz[<i>a</i>]anthracene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Benz[<i>j</i>]aceanthrylene (Vol. 92; in preparation)
Combustion Product	Benzo[<i>b</i>]fluoranthene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Benzo[<i>c</i>]phenanthrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Benzo[<i>j</i>]fluoranthene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Benzo[<i>k</i>]fluoranthene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Chrysene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Dibenz[<i>a,h</i>]acridine (Vol. 32, Suppl. 7; 1987)
Combustion Product	Dibenz[<i>a,j</i>]acridine (Vol. 32, Suppl. 7; 1987)
Combustion Product	Dibenzo[<i>a,h</i>]pyrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Dibenzo[<i>a,i</i>]pyrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Combustion Product	Engine exhaust, gasoline (Vol. 46; 1989)
Combustion Product	Indeno[1,2,3- <i>cd</i>]pyrene (Vol. 32, Suppl. 7, Vol. 92; in preparation)
Dietary	3-(<i>N</i> -Nitrosomethylamino)propionitrile (Vol. 85; 2004)
Dietary	A- α -C (2-Amino-9 <i>H</i> -pyrido[2,3- <i>b</i>]indole) (Vol. 40, Suppl. 7; 1987)
Dietary	AF-2 [2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide] (Vol.31, Suppl. 7; 1987)
Dietary	Azaserine (Vol. 10, Suppl. 7; 1987)
Dietary	Bracken fern (Vol. 40, Suppl. 7; 1987)
Dietary	Butylated hydroxyanisole (BHA) (Vol. 40, Suppl. 7; 1987)
Dietary	Caffeic acid (Vol. 56; 1993)
Dietary	Carrageenan, degraded (Vol. 31, Suppl. 7; 1987)
Dietary	Coffee (Vol. 51; 1991)
Dietary	Cycasin (Vol. 10, Suppl. 7; 1987)
Dietary	Daunomycin (Vol. 10, Suppl. 7; 1987)
Dietary	Dihydrosafrole (Vol. 10, Suppl. 7; 1987)
Dietary	Glu-P-1 (2-Amino-6-methyldipyrido[1,2- <i>a</i> :3',2'- <i>d</i>]imidazole) (Vol. 40, Suppl. 7; 1987)
Dietary	Glu-P-2 (2-Aminodipyrido[1,2- <i>a</i> :3',2'- <i>d</i>]imidazole) (Vol. 40, Suppl. 7; 1987)
Dietary	Iron-dextran complex (Vol. 2, Suppl. 7; 1987)
Dietary	Lasiocarpine (Vol. 10, Suppl. 7; 1987)
Dietary	MeA- α -C (2-Amino-3-methyl-9 <i>H</i> -pyrido[2,3- <i>b</i>]indole) (Vol. 40, Suppl. 7; 1987)
Dietary	MeIQ (2-Amino-3,4-dimethylimidazo[4,5- <i>f</i>]quinoline) (Vol. 56; 1993)
Dietary	MeIQx (2-Amino-3,8-dimethylimidazo[4,5- <i>f</i>]quinoxaline) (Vol. 56; 1993)
Dietary	Methylazoxymethanol acetate (Vol. 10, Suppl. 7; 1987)
Dietary	Mitomycin C (Vol. 10, Suppl. 7; 1987)
Dietary	Monocrotaline (Vol. 10, Suppl. 7; 1987)
Dietary	PhIP (2-Amino-1-methyl-6-phenylimidazo[4,5- <i>b</i>]pyridine) (Vol. 56; 1993)
Dietary	Pickled vegetables (traditional in Asia) (Vol. 56; 1993)
Dietary	Safrole (Vol. 10, Suppl. 7; 1987)
Dietary	Sterigmatocystin (Vol. 10, Suppl. 7; 1987)
Dietary	Trp-P-1 (3-Amino-1,4-dimethyl-5 <i>H</i> -pyrido[4,3- <i>b</i>]indole) (Vol. 31, Suppl. 7; 1987)
Dietary	Trp-P-2 (3-Amino-1-methyl-5 <i>H</i> -pyrido[4,3- <i>b</i>]indole) (Vol. 31, Suppl. 7; 1987)
Exposure Circumstance	Carpentry and joinery (Vol. 25, Suppl. 7; 1987)
Exposure Circumstance	Cobalt Metals without tungsten carbide (Vol. 86; 2006)
Exposure Circumstance	Dry cleaning (occupational exposures in) (Vol. 63; 1995)
Exposure Circumstance	Firefighter (occupational exposure as a) (Vol. 98, in preparation)
Exposure Circumstance	Printing processes (occupational exposures in) (Vol. 65; 1996)
Exposure Circumstance	Textile manufacturing industry (work in) (Vol. 48; 1990)
Fibres & Dust	Palygorskite (attapulgitite)(long fibres, > 5 micrometres)(Vol. 68; 1997)
Fibres & Dust	Refractory ceramic fibres (Vol. 43, Vol. 81; 2002)
Fibres & Dust	Special-purpose fibres such as E-glass & '475' glass fibres (Vol. 81; 2002)
Hormone	Medroxyprogesterone acetate (Vol. 21, Suppl. 7; 1987)
Hormones	Progestins (Suppl. 7; 1987)

Hormones	Progestogen-only contraceptives (Vol. 72; 1999)
Industrial Chemical	1,1-Dimethylhydrazine (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	1,2-Dichloroethane (Vol. 20, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	1,2-Diethylhydrazine (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	1,2-Epoxybutane (Vol. 47, Vol. 71; 1999)
Industrial Chemical	1,3-Dichloropropene (technical-grade) (Vol. 41, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	1,3-Propane sultone (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	1,4-Dioxane (Vol. 11, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	1-Chloro-2-methylpropene [513-37-1] (Vol. 63; 1995)
Industrial Chemical	2,2-Bis(bromomethyl)propane-1,3-diol (Vol. 77; 2000)
Industrial Chemical	2,3-Dibromopropan-1-ol (Vol. 77; 2000)
Industrial Chemical	2,4-Diaminoanisole (Vol. 79; 2001)
Industrial Chemical	2,4-Diaminotoluene (Vol. 16, Suppl. 7; 1987)
Industrial Chemical	2,4-Dinitrotoluene (Vol. 65; 1996)
Industrial Chemical	2,6-Dimethylaniline (2,6-Xylidine) (Vol. 57; 1993)
Industrial Chemical	2,6-Dinitrotoluene (Vol. 65; 1996)
Industrial Chemical	2-Methyl-1-nitroanthraquinone (uncertain purity) (Vol. 27, Suppl. 7; 1987)
Industrial Chemical	2-Nitroanisole (Vol. 65; 1996)
Industrial Chemical	2-Nitropropane (Vol. 29, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	3,3'-Dichloro-4,4'-diaminodiphenyl ether (Vol. 16, Suppl. 7; 1987)
Industrial Chemical	3,3'-Dichlorobenzidine (Vol. 29, Suppl. 7; 1987)
Industrial Chemical	3,3'-Dimethoxybenzidine (<i>ortho</i> -Dianisidine) (Vol. 4, Suppl. 7; 1987)
Industrial Chemical	3,3'-Dimethylbenzidine (<i>ortho</i> -Tolidine) (Vol. 1, Suppl. 7; 1987)
Industrial Chemical	3,7-Dinitrofluoranthene (Vol. 65; 1996)
Industrial Chemical	3,9-Dinitrofluoranthene (Vol. 65; 1996)
Industrial Chemical	3-Chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (Vol. 84; 2004)
Industrial Chemical	4,4'-Diaminodiphenyl ether (Vol. 29, Suppl. 7; 1987)
Industrial Chemical	4,4'-Methylene bis(2-methylaniline) (Vol. 4, Suppl. 7; 1987)
Industrial Chemical	4,4'-Methylenedianiline (Vol. 39, Suppl. 7; 1987)
Industrial Chemical	4,4'-Thiodianiline (Vol. 27, Suppl. 7; 1987)
Industrial Chemical	4-Chloro- <i>ortho</i> -phenylenediamine (Vol. 27, Suppl. 7; 1987)
Industrial Chemical	4-Vinylcyclohexene (Vol. 60; 1994)
Industrial Chemical	4-Vinylcyclohexene diepoxide (Vol. 60; 1994)
Industrial Chemical	5-Nitroacenaphthene (Vol. 16, Suppl. 7; 1987)
Industrial Chemical	Acetaldehyde (Vol. 36, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Acetamide (Vol. 7, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Acrylonitrile (Vol. 71; 1999)
Industrial Chemical	Auramine (technical-grade) (Vol. 1, Suppl. 7; 1987)
Industrial Chemical	Aziridine (Vol. 9, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Benzofuran (Vol. 63; 1995)
Industrial Chemical	Benzyl violet 4B (Vol. 16, Suppl. 7; 1987)
Industrial Chemical	beta-Butyrolactone (Vol. 11, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	beta-Propiolactone (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Bitumens, extracts of steam-refined and air-refined (Vol. 35, Suppl. 7; 1987)
Industrial Chemical	Bromodichloromethane (Vol. 52, Vol. 71; 1999)
Industrial Chemical	Carbon black (Vol. 65, Vol. 93; in preparation)
Industrial Chemical	Carbon tetrachloride (Vol. 20, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Catechol (Vol. 15, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Chlorendic acid (Vol. 48; 1990)
Industrial Chemical	Chlorinated paraffins of average carbon chain length C12 and average degree of chlorination approximately 60% (Vol. 48; 1990)
Industrial Chemical	Chloroform (Vol. 73; 1999)
Industrial Chemical	Chloroprene (Vol. 71; 1999)
Industrial Chemical	CI Acid Red 114 (Vol. 57; 1993)
Industrial Chemical	CI Basic Red 9 (Vol. 57; 1993)
Industrial Chemical	CI Direct Blue 15 (Vol. 57; 1993)

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Industrial Chemical	Citrus Red No. 2 (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	Dichloroacetic acid (Vol. 84; 2004)
Industrial Chemical	Dichloromethane (methylene chloride) (Vol. 71; 1999)
Industrial Chemical	Diesel fuel, marine (Vol. 45; 1989)
Industrial Chemical	Diglycidyl resorcinol ether (Vol. 36, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Diisopropyl sulfate (Vol. 54, Vol. 71; 1999)
Industrial Chemical	Disperse Blue 1 (Vol. 48; 1990)
Industrial Chemical	Ethyl acrylate (Vol. 39, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Ethylbenzene (Vol. 77; 2000)
Industrial Chemical	Fuel oils, residual (heavy) (Vol. 45; 1989)
Industrial Chemical	Furan (Vol. 63; 1995)
Industrial Chemical	Gasoline (Vol. 45; 1989)
Industrial Chemical	Glycidaldehyde [765-34-4] (Vol. 11, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	HC Blue No. 1 [2784-94-3] (Vol. 57; 1993)
Industrial Chemical	Hexachloroethane (Vol. 73; 1999)
Industrial Chemical	Hexamethylphosphoramide (Vol. 15, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Hydrazine (Vol. 4, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Isoprene (Vol. 60, Vol. 71; 1999)
Industrial Chemical	Magenta (containing CI Basic Red 9) (Vol. 57; 1993)
Industrial Chemical	<i>N,N'</i> -Diacetylbenzidine (Vol. 16, Suppl. 7; 1987)
Industrial Chemical	Naphthalene (Vol. 82; 2002)
Industrial Chemical	Nitrilotriacetic acid and its salts (Vol. 73; 1999)
Industrial Chemical	Nitrobenzene (Vol. 65; 1996)
Industrial Chemical	Nitromethane (Vol. 77; 2000)
Industrial Chemical	<i>N</i> -Methyl- <i>N</i> -nitrosourethane (Vol. 4, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosodiethanolamine (Vol. 17, Suppl. 7, Vol. 77; 2000)
Industrial Chemical	<i>N</i> -Nitrosodi- <i>n</i> -butylamine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosodi- <i>n</i> -propylamine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosomethylethylamine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosomethylvinylamine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosomorpholine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosopiperidine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrosopyrrolidine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	<i>N</i> -Nitrososarcosine (Vol. 17, Suppl. 7; 1987)
Industrial Chemical	Oil Orange SS (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	<i>ortho</i> -Aminoazotoluene (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	<i>ortho</i> -Anisidine (Vol. 73; 1999)
Industrial Chemical	<i>para</i> -Aminoazobenzene (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	<i>para</i> -Chloroaniline (Vol. 57; 1993)
Industrial Chemical	<i>para</i> -Cresidine (Vol. 27, Suppl. 7; 1987)
Industrial Chemical	<i>para</i> -Dimethylaminoazobenzene (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	Phenyl glycidyl ether (Vol. 47, Vol. 71; 1999)
Industrial Chemical	Polybrominated biphenyls (Vol. 41, Suppl. 7; 1987)
Industrial Chemical	Ponceau 3R (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	Ponceau MX (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	Potassium bromate (Vol. 73; 1999)
Industrial Chemical	Propylene oxide (Vol. 60; 1994)
Industrial Chemical	Styrene (Vol. 60, 82; 2002)
Industrial Chemical	Tetrafluoroethylene (Vol. 19, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Tetranitromethane (Vol. 65; 1996)
Industrial Chemical	Titanium dioxide (Vol. 47, Vol. 93; in preparation)
Industrial Chemical	Toluene diisocyanates (Vol. 39, Suppl. 7, Vol. 71; 1999)
Industrial Chemical	Trypan blue (Vol. 8, Suppl. 7; 1987)
Industrial Chemical	Vinyl acetate (Vol. 63; 1995)
Metals	Antimony trioxide (Vol. 47; 1989)
Metals	Cobalt and cobalt compounds (Vol. 52; 1991)

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Metals	Cobalt sulfate and other soluble cobalt(II) salts (Vol. 86; 2006)
Metals	Lead (Vol. 23, Suppl. 7; 1987)
Metals	Methylmercury compounds (Vol. 58; 1993)
Metals	Nickel, Metalslic and alloys (Vol. 49; 1990)
Metals	Vanadium pentoxide (Vol. 86; in preparation)
Metals	Welding fumes (Vol. 49; 1990)
Microbiological Agents	Aflatoxin M1 (Vol. 56; 1993)
Microbiological Agents	Fumonisin B ₁ (Vol. 82; 2002)
Microbiological Agents	Human immunodeficiency virus type 2 (infection with) (Vol. 67; 1996)
Microbiological Agents	Human papillomavirus genus beta (some types) (Vol. 90; in preparation)
Microbiological Agents	Human papillomavirus types 6 and 11 (Vol. 90; in preparation)
Microbiological Agents	Microcystin-LR (Vol. 94; in preparation)
Microbiological Agents	Ochratoxin A (Vol. 56; 1993)
Microbiological Agents	<i>Schistosoma japonicum</i> (infection with) (Vol. 61; 1994)
Microbiological Agents	Toxins derived from <i>Fusarium moniliforme</i> (Vol. 56; 1993)
Pesticides	1,2-Dibromo-3-chloropropane (Vol. 20, Suppl. 7, Vol. 71; 1999)
Pesticides	Aramite® (Vol. 5, Suppl. 7; 1987)
Pesticides	Chlordane (Vol. 79; 2001)
Pesticides	Chlordecone (Kepone) (Vol. 20, Suppl. 7; 1987)
Pesticides	Chlorophenoxy herbicides (Vol. 41, Suppl. 7; 1987)
Pesticides	Chlorothalonil (Vol. 73; 1999)
Pesticides	DDT [<i>p,p'</i> -DDT, 50-29-3] (Vol. 53; 1991)
Pesticides	Dichlorvos (Vol. 53; 1991)
Pesticides	Heptachlor (Vol. 79; 2001)
Pesticides	Hexachlorobenzene (Vol. 79; 2001)
Pesticides	Hexachlorocyclohexanes (Lindane) (Vol. 20, Suppl. 7; 1987)
Pesticides	Mirex (Vol. 20, Suppl. 7; 1987)
Pesticides	Nitrofen (technical-grade) (Vol. 30, Suppl. 7; 1987)
Pesticides	<i>para</i> -Dichlorobenzene (Vol. 73; 1999)
Pesticides	Polychlorophenols and their sodium salts (mixed exposures) (Vol. 41, Suppl. 7, Vol. 53, Vol. 71; 1999)
Pesticides	Sodium <i>ortho</i> -phenylphenate (Vol. 73; 1999)
Pesticides	Sulfallate (Vol. 30, Suppl. 7; 1987)
Pesticides	Toxaphene (Polychlorinated camphenes) (Vol. 79; 2001)
Pharmacological	1-[(5-Nitrofurfurylidene)amino]-2-imidazolidinone (Vol. 7, Suppl. 7; 1987)
Pharmacological	1-Hydroxyanthraquinone (Vol. 82; 2002)
Pharmacological	2-(2-Formylhydrazino)-4-(5-nitro-2-furyl)thiazole (Vol. 7, Suppl. 7; 1987)
Pharmacological	2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole (Vol. 7, Suppl. 7; 1987)
Pharmacological	2-Methylaziridine (Propyleneimine) (Vol. 9, Suppl. 7, Vol. 71; 1999)
Pharmacological	5-(Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolidinone (Vol. 7, Suppl. 7; 1987)
Pharmacological	Amsacrine (Vol. 76; 2000)
Pharmacological	Bleomycins (Vol. 26, Suppl. 7; 1987)
Pharmacological	Dacarbazine (Vol. 26, Suppl. 7; 1987)
Pharmacological	Dantron (Chrysazin; 1,8-Dihydroxyanthraquinone) (Vol. 50; 1990)
Pharmacological	Ethyl methanesulfonate (Vol. 7, Suppl. 7; 1987)
Pharmacological	Griseofulvin [126-07-8] (Vol. 79; 2001)
Pharmacological	Merphalan (Vol. 9, Suppl. 7; 1987)
Pharmacological	Methylthiouracil (Vol. 79; 2001)
Pharmacological	Metronidazole (Vol. 13, Suppl. 7; 1987)
Pharmacological	Mitoxantrone (Vol. 76; 2000)
Pharmacological	N-[4-(5-Nitro-2-furyl)-2-thiazolyl]acetamide (Vol. 7, Suppl. 7; 1987)
Pharmacological	Nafenopin (Vol. 24, Suppl. 7; 1987)
Pharmacological	Niridazole (Vol. 13, Suppl. 7; 1987)
Pharmacological	Nitrogen mustard N-oxide (Vol. 9, Suppl. 7; 1987)
Pharmacological	Oxazepam (Vol. 66; 1996)

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Pharmacological	Panfuran S [794-93-4] (containing dihydroxymethylfuratrizine) (Vol. 24, Suppl. 7; 1987)
Pharmacological	Phenazopyridine hydrochloride (Vol. 24, Suppl. 7; 1987)
Pharmacological	Phenobarbital (Vol. 79; 2001)
Pharmacological	Phenolphthalein (Vol. 76; 2000)
Pharmacological	Phenoxybenzamine hydrochloride (Vol. 24, Suppl. 7; 1987)
Pharmacological	Phenytoin (Vol. 66; 1996)
Pharmacological	Propylthiouracil (Vol. 79; 2001)
Pharmacological	Riddelliine (Vol. 10, Suppl. 7, Vol. 82; 2002)
Pharmacological	Streptozotocin (Vol. 17, Suppl. 7; 1987)
Pharmacological	Surgical implants and other foreign bodies (Vol. 74; 1999):
Pharmacological	Talc-based body powder (perineal use of) (Vol. 93; in preparation)
Pharmacological	Thioacetamide (Vol. 7, Suppl. 7; 1987)
Pharmacological	Thiouracil (Vol. 79; 2001)
Pharmacological	<i>trans</i> -2-[(Dimethylamino)methylimino]-5-[2-(5-nitro-2-furyl)-vinyl]-1,3,4-oxadiazole (Vol. 7, Suppl. 7; 1987)
Pharmacological	Trichlormethine (Trimustine hydrochloride) (Vol. 50; 1990)
Pharmacological	Uracil mustard (Vol. 9, Suppl. 7; 1987)
Pharmacological	Zalcitabine (Vol. 76; 2000)
Pharmacological	Zidovudine (AZT) (Vol. 76; 2000)
Radiation	Magnetic fields (extremely low-frequency) (Vol. 80; 2002)

Appendix B: Detailed Description of Resources Consulted

General Resources

HSDB: The U.S. Hazardous Substances Databank (<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>)

The HSDB includes peer-reviewed toxicology, exposure, manufacturing and use information, and human health effects data for nearly all the chemicals on the IARC 2B list. The HSDB exists as a part of ToxNet (the Toxicology Data Network of the National Library of Medicine).

NTP: The U.S. National Toxicology Program's 11th Report on Carcinogens (<http://ntp.niehs.nih.gov/index.cfm?objectid=32BA9724-F1F6-975E-7FCE50709CB4C932>)

The NTP Report on Carcinogens was consulted for all available chemicals as it contains summary documentation of carcinogenic risks and exposure and use information (often separated into categories of occupational and environmental).

ATSDR: The U.S. Agency for Toxic Substances and Disease Registry Toxicologic Profiles (<http://www.atsdr.cdc.gov/>)

The ATSDR produces toxicological profiles for many substances that are included on the IARC 2B list. These voluminous documents include animal and human toxicity data, chemical uses, manufacturing information, sources of exposure, and other health effects.

Types of crops (for pesticides only):

This information mostly collected in general searches of the NTP and ATSDR (see above), and notes the types of crops that each pesticide is commonly used on, or the types of consumer products affected (where applicable). This information is included under "Potential exposure circumstances" in the tables in Appendix C for pesticides only.

IARC: The International Agency for Research on Cancer Monograph Summaries (<http://monographs.iarc.fr/>)

The summaries of all of their monographs available online that include the Types of cancer caused, other health effects, and results of animal studies (and human, where available).

General internet searches

General search strategies were also employed for all chemicals. This was especially useful for locating names of chemical companies who sell the products, or other government based documents not identified via the portals above, and often any of the most important peer-reviewed studies. Synonyms and CAS numbers were also often found in this way.

Description of Other Resources Included in Tables

CEPA: Canadian Environmental Protection Act (1999) (http://www.ec.gc.ca/TOXICS/EN/mainlist.cfm?par_actn=s2)

One of CEPA's mandates is to regulate the use of 'toxic' substances. CEPA defines a substance as 'toxic' if it enters or may enter the environment under conditions that (a) negatively affect the environment or biological diversity, (b) constitute a danger to the environment on which life depends, or (c) are a danger to human health. These letters are the paragraphs referred to in our tables. CEPA also requires that substances of interest be

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evaluated for addition to the Toxic list periodically. When being considered, substances are added to Priority Substances Lists (PSL), after which they are either added to the Toxic list, deemed not toxic, or left on the PSL if a decision cannot be made. We have noted in our table those substances that appear on a PSL.

HC: Health Canada's Domestic Substances List (DSL) (http://www.hc-sc.gc.ca/ewh-semt/contaminants/existsub/categor/_result_substance/index_e.html)

The DSL is a list of approximately 23,000 chemicals reported by industry to be in use in Canadian facilities between 1984 and 1986. They were categorized with respect to their potential for exposure to Canadians by Health Canada (based on several criteria, but generally the amount in use and the number of facilities reporting use of the chemical at that time), as well as their toxicity to humans. The acronyms reported in our tables (LPE, IPE, and GPE) refer to chemicals classified as having a Low, Intermediate, or Greatest Potential for Exposure. There is also a category called "already risk managed", which refers to chemicals that were already targeted for some kind of regulatory action, and hence considered low priority by Health Canada.

Workplace Measurements: Workplace exposure measurements collected in BC, ON, and QC. This section refers to the number of samples that have been collected by the provincial workplace compensatory boards for Ontario, British Columbia, and Quebec, and provide evidence for the presence of substances in Canadian workplaces.

CAREX Canada: The International Information System on Occupational Exposure to Carcinogens (<http://web.cher.ubc.ca/CAREX/default.htm>)

CAREX was initially developed by the Finnish Institute for Occupational Health and subsequently used as a model for a Canadian-based pilot project of the same name. The numbers in our tables refer to the estimated number of workers exposed to each included substance in workplaces in BC and Ontario. This category is only included for those chemicals that were examined in the CAREX project.

NPRI 2006: The National Pollutant Release Inventory (http://www.ec.gc.ca/pdb/queriesite/query_e.cfm)

The NPRI contains the names of companies and yearly amounts released to the environment, disposed of, or sent for recycling for toxic chemicals since 1994. This database is maintained by Environment Canada. The numbers included in our tables are the sum of environmental release (to air, water, or soil) and disposals in 2006. Although reporting to the NPRI is a legal requirement, there are several criteria (depending on the chemical) that determine whether or not a company must report. For most of the chemicals on the list, reporting is not required unless ≥ 10 tonnes of the substance are used and 20,000 employee hours per year are worked. There are also some chemicals (i.e. some metals, dioxins) with lower reporting criteria.

TradeMap: TradeMap, a subsidiary of ExportSource Canada (<http://www.trademap.net/canada/en/login.htm>)

This database tracks import/export data for a variety of chemicals and consumer products by year (in our report we report data from 2006). We used this resource to identify whether a chemical was likely to be manufactured, used, or imported into Canada, increasing its priority for further research.

IC: Industry Canada's Canadian Company Capabilities (CCC) Databank
(<http://strategis.ic.gc.ca/app/csc/srch/cscBscSrch.do?lang=eng&prtl=1&app=1>)

The CCC is a voluntary databank where chemical names can be searched for, and companies providing a service or process that uses that chemical are listed. In the tables, the number of companies that were found to be associated with each chemical is reported.

Challenge: The Government of Canada's Challenge to Industry
(http://www.chemicalsubstanceschimiques.gc.ca/challenge-defi/index_e.html)

This section designates whether a substance was included in the Government's Challenge to Industry. This is a program that seeks to gather key information on Canadian production and uses of chemicals highlighted during the categorization of the DSL as high priorities for action. There are 12 'Batches' in the Challenge that divide up the approximately 200 substances into more manageable groups. The Challenge is a current initiative under the recently created Chemical Substances program (Government of Canada). This information is only included in the tables for substances that appear in the Challenge.

CSI: ChemSources (Chemical Sources International) Database (http://db.chemsources.com/cgi-bin/foxweb.exe/validate_user@csi/login)

The ChemSources database is an online catalogue of chemical suppliers from around the world, searchable by chemical name or chemical abstract number (CAS). In our tables, we have noted how many (if any) Canadian suppliers were found in the database for each chemical.

CCOHS: Canadian Centre for Occupational Health and Safety MSDS Database
(<http://ccinfoweb.ccohs.ca/msds/search.html>)

The CCOHS maintains a databank of approximately 310,000 Material Safety Data Sheets (MSDS's) from over 2000 North American companies. In our tables, we include the number of MSDS's found for each chemical, which may give a sense of usage levels of chemicals in North America. In our searches, we also noted whether any Canadian companies were included as providers of the MSDS's (considered as part of the prioritization), although many commercial products cross the border.

US HPD: US National Library of Medicine Household Products Database (<http://hpd.nlm.nih.gov/>)

This American-based dataset is maintained by a branch of the National Library of Medicine in the National Institutes of Health in the US. It includes information (largely abstracted from MSDS's) about the ingredients in consumer goods on the market in the US (and because of free trade, most likely available in Canada as well). In our tables, we included the number of products found with the particular chemical in them, in addition to the general types of goods found (i.e. paints, adhesives, cleaning products, etc.).

Pathway: Pathway from NTP and ATSDR

This information, which was mostly collected in general searches of the NTP and ATSDR (see above), notes the potential routes of exposure for each substance, highlighting the most important one where available.

Environmental measurements: Preliminary Scan for Environmental Exposure Measurements

This section notes whether environmental data on potential exposures was found in our preliminary searches, if any. It should be noted that an exhaustive review of the literature

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for potential exposures has not yet been completed; this information is included to note where measurements are readily available.

Pesticide use surveys: Pesticide Surveys from Ontario and British Columbia (BC 1999:

http://www.pyr.ec.gc.ca/georgiaBasin/reports/Pesticide_Use_BC/GBEI_REPORT_01_032_e.pdf; BC 2003:

http://www.env.gov.bc.ca/epd/epdpa/ipmp/technical_reports/pesticide_survey2003/pest_survey_03.pdf;

Ontario 2003: <http://www.agcare.org/uploadattachments/pesticide%20survey%202003%20final%20report.pdf>).

Two surveys of pesticide usage patterns were carried out in British Columbia (one in 1999 and one in 2003). They were produced by a consulting firm for Environment Canada the BC Ministry of the Environment and include data on the types and quantities of pesticides sold and used in BC during those years. A similar pesticide use survey was produced in Ontario in 2003 by the Ontario Ministry of Agriculture and Food. These three surveys were used to ascertain pesticide usage patterns in these 2 provinces.

PMRA: The Pesticide Management Regulatory Agency Registration (http://pr-rp.pmr-arla.gc.ca/portal/page?_pageid=34,6928,34_6960:34_7232&_dad=portal&_schema=PORTAL)

PMRA is the governmental body in charge of the approval and review of all pesticides for use in Canada. The registration status of all pesticides on the 2B list was checked, and the tables include the number of registered products in Canada.

Mines/smelters and Geologic deposits: Information from NRCan and USGS

NRCan: Natural Resources Canada (<http://www.nrcan.gc.ca/>)

NRCan provides a variety of information on the location of mineral and metal geologic deposits in Canada, as well as the location and operational status of smelters (or other processing plants) and mines. This is in various forms, including the Mineral and Metal Commodity reviews, as well as many maps and other summaries.

USGS: US Geologic Survey (<http://minerals.usgs.gov/minerals/pubs/country/latin.html#ca>)

The USGS provides information on the mining industry worldwide, catalogued both by country and by commodity. These summaries were used to help determine whether active Canadian mining or exploration was taking place for each metal or mineral in the IARC 2B list.

Appendix C: Summary Table of Key Information Used in Prioritization Process, by category and in alphabetical order (begins with numbers)

Industrial chemicals

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
1,2-Dichloroethane (ethylene dichloride)	IARC 2B Neurotoxin; nephrotoxin; hepatotoxin CEPA: Toxic 'c' (human health) HC: Already risk managed	Production of vinyl chloride; Manufacture/processing (especially during maintenance)	NPRI 2006: 4 companies (9 tonnes) TradeMap: Imported 100 tonnes; exported 320000 tonnes IC: 2 companies CSI: 1 supplier CCOHS: 1 MSDS Workplace measurements: 46 (ON); 328 (BC); none (PQ)	Group A
1,2-Epoxybutane (ethyloxirane; 1-butene oxide)	IARC 2B Moderate toxin CEPA: No HC: IPE	Production/use of chlorinated solvents; Manufacture of the chemical	NPRI 2006: No releases since 2001 (0.1 tonne) TradeMap: Not found IC: Not found Challenge: Batch 1 CSI: No CCOHS: None found Workplace measurements: None	Group B: Little information located, but included in the Challenge, and IPE.
1,4-Dioxane (diethylene dioxide; dioxane)	IARC 2B Hepatotoxin; nephrotoxin CEPA: No HC: GPE	Production of dioxane; Production of plastics and some cosmetics, paints, cleaning chemicals	NPRI 2006: 3 companies (1 tonne) TradeMap: Not found IC: 1 company Challenge: Batch 7 CSI: 1 supplier CCOHS: 5 MSDS Workplace measurements: 345 (ON); 56 (BC)	Group A

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
1,2,3-Trichloropropane	IARC 2A Eye and throat irritant; CNS depressant CEPA: No HC: LPE	Via use as a chemical intermediate (used to make 1,3-dichloropropene or Telone, polysulfides)	CAREX: 15 exposed (ON); 0 (BC) NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: n/a CCOHS: None found Workplace measurements: None	Group B: Likely a limited-use chemical, but Telone is still used in Canada.
1,3-Butadiene	IARC 1 Respiratory irritant; asphyxiant CEPA: Yes, paragraphs 'b' and 'c' HC: Already risk managed	Manufacture of plastics, chemicals, and rubber; Exposures in the petroleum refining industry (combustion)	CAREX: 700 exposed (ON); 0 (BC) NPRI 2006: 20 companies (82 tonnes) TradeMap: 'buta-1,3-diene and isoprene': exported 64998 tonnes; imported 15773 tonnes (many other butadiene-related products) IC: 5 companies CSI: 1 supplier CCOHS: 1 MSDS Workplace measurements: 324 (ON)	Group A
2-Nitropropane (nipar S-20)	IARC 2B CNS depressant; hepatotoxin CEPA: No HC: IPE	Printing, painting and solvent extraction industries	NPRI 2006: No releases since 1996 (0.125 tonne) TradeMap: Not found IC: 1 company Challenge: Batch 10 CSI: 1 supplier CCOHS: None found Workplace measurements: 28 (ON)	Group B
2,4-Diaminotoluene (fouramine; toluenediamine)	IARC 2B Extremely potent skin irritant CEPA: No HC: LPE	Production of toluene diisocyanates; Dye and textile manufacture	NPRI 2006: None reported since 1994 TradeMap: Imported 2800 tonnes; exported 414 tonnes (group of related chemicals) IC: Not found CSI: 1 supplier CCOHS: None found Workplace measurements: None	Group B: Little information, but may be used in TDI production

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
2,4-Dinitrotoluene (2,4-DNT)	IARC 2B Causes cyanosis; dermatitis CEPA: No HC: LPE	Production of toluene diisocyanates and diamines; Production of explosives and dyes	NPRI 2006: No releases (but 14.2 tonnes in 2005). 'Mixed isomers': 1 company (0.1 tonne) TradeMap: Not found IC: Not found CSI: 2 suppliers CCOHS: None found Workplace measurements: None	Group B: Little information, but may be used in TDI production, and is used in explosives.
2,6-Dinitrotoluene (2,6-DNT)	IARC 2B Causes cyanosis; dermatitis CEPA: No HC: LPE	Production of toluene diisocyanates and diamines; Production of explosives and dyes	NPRI 2006: No releases on record. 'Mixed isomers': 1 company (0.1 tonne) TradeMap: Not found IC: Not found CSI: No CCOHS: None found Workplace measurements: None	Group B: Little information, but may be used in TDI production or explosives.
3,3'-Dichlorobenzidine	IARC 2B Respiratory irritant; burns and dermatitis; CNS depressant CEPA: No, but on PSL1 HC: LPE	Pigment manufacture; Production of coloured plastics	NPRI 2006: HCl salt only, last report in 2003 (0.002 tonne). TradeMap: Not found. Other source: imports of 100 tonnes per year of the HCl salt by 1 company IC: 1 company CSI: No CCOHS: 3 MSDS Workplace measurements: None	Group B: Exposures likely low, but could be higher for subgroups.
3,3'-Dimethoxybenzidine (o-dianisidine)	IARC 2B Skin irritant CEPA: No HC: LPE	Dye manufacture; Diisocyanate production; Textile processing	NPRI 2006: Not found TradeMap: Imported 77 tonnes (chemical group) IC: Not found CSI: No CCOHS: 2 MSDS Workplace measurements: None	Group B: Specific info not found, but likely used.

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
3,3'-Dimethylbenzidine (o-tolidine)	IARC 2B Skin and eye irritant CEPA: No HC: LPE	Dye manufacture; Pool/hot-tub technicians; Preparation of chlorine testing kits	NPRI 2006: Not found TradeMap: Not found IC: Not specific, but 43 companies under 'swimming pool chemicals' CSI: 1 supplier CCOHS: 14 MSDS Workplace measurements: None	Group B: Evidence that it is used and produced in Canada; exposure likely low
4,4'-Methylene bis(2-chloroaniline) (MOCA or MBOCA)	IARC 2A Blood problems; kidney and liver damage CEPA: No HC: IPE	During polyurethane production (used as a curing agent); During epoxy resin production	CAREX: Yes, but exposures not expected. NPRI 2006: 2 companies (14 tonnes) TradeMap: Not found, but HC reports 100-1000 tonnes imported in 2000 IC: Not found CSI: No CCOHS: None Workplace measurements: 408 (ON); 439 (BC)	Group B: Likely still used, but exposure controls limit exposure.
4,4'-Methylenedianiline (MDA)	IARC 2B Hepatotoxin (jaundice) CEPA: No HC: LPE	During MDI production; During production of epoxy resins and polyurethane foams	NPRI 2006: No releases since 2003 (0.013 tonne) TradeMap: Not found IC: Not found CSI: 1 supplier CCOHS: None found Workplace measurements: 34 (ON)	Group B: Likely used; specific information difficult to find.
Acetaldehyde (ethanal)	IARC 2B CNS depressant; severe irritant CEPA: Toxic 'b' and 'c' (environment; human health) HC: Already risk managed	Mainly production of pentaerythritol; Also production of acetic acid, fragrances, pesticides, flavours, rubber	NPRI 2006: 86 companies (1300 tonnes) TradeMap: Not found. Other source: 6-7000 tonnes imported and less than 10 tonnes exported (1996) IC: 1 company for 'pentaerythritol' CSI: 1 supplier CCOHS: 14 MSDS Workplace measurements: 1273 (ON); 261 (BC); 728 (PQ)	Group A

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Acrylamide	IARC 2A Irritant; skin blistering; CNS depressant CEPA: No HC: GPE	Working in research laboratories; Manufacture of polyacrylamides, rubber, foods (produced during cooking of starchy foods)	CAREX: 600 exposed (ON); 200 (BC) NPRI 2006: 6 companies (2 tonnes) TradeMap: Not found IC: 3 companies (waste treatment) Challenge: Batch 5b CSI: 2 suppliers CCOHS: 63 MSDS Workplace measurements: 15 (ON)	Group A: Captured by Carex; produced and used in Canada.
Acrylonitrile (vinyl cyanide)	IARC 2B Hepatotoxin CEPA Toxic 'C' (human health) HC: Already risk managed	Manufacture of acrylics, adiponitrile; Resin production; Rubber and plastics (ABS resins)	CAREX: 1900 exposed (ON); 800 (BC) NPRI 2006: 11 companies (36 tonnes) TradeMap: Imported 4000 tonnes; exported 4 tonnes IC: 4 companies CSI: 1 supplier CCOHS: 25 MSDS Workplace measurements: 728 (ON)	Group A
Benzene	IARC 1 Irritant; CNS depressant; blood problems CEPA: Yes, paragraph 'c' HC: Already risk managed	Gasoline or diesel exposure (wide variety of industries); Petroleum refining; Production of other chemicals (i.e. ethylbenzene)	CAREX: 101000 exposed (ON); 40000 (BC) NPRI 2006: 218 companies (1600 tonnes) TradeMap: Exported 301000 tonnes; imported 10000 tonnes IC: 20 companies (petroleum industry) CSI: None listed CCOHS: 29 MSDS for pure benzene; 109 related Workplace measurements: 1442 (ON); 778 (BC); 1240 (PQ)	Group A
Benzyl chloride	IARC 2A Irritant; blood problems; CNS depressant; lung damage CEPA: No HC: GPE	During manufacture of perfumes, drugs, dyes, resins	NPRI 2006: 2 companies (34 tonnes) TradeMap: Not found IC: 1 company CSI: 2 suppliers Challenge: Batch 6b CCOHS: 18 MSDS Workplace measurements: None	Group B: many references suggest it's used in a closed system, but is likely still used

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Bitumens, extracts of steam and air-refined (asphalt)	IARC 2B Severe burns; dermatitis; keratosis; skin, eye, respiratory irritant CEPA: No HC: GPE	During extraction (i.e. oil sands); Paving and roofing occupations	NPRI 2006: Not found TradeMap: For 'bitumen & asphalt' Imported 650000 tonnes; exported 100000 tonnes. Other relevant entries noted. IC: 12 companies CSI: No CCOHS: 21 MSDS Workplace measurements: 281 (ON); 127 (BC)	Group A
Carbon black	IARC 2B Lung function problems; pneumoconiosis; skin problems CEPA: No HC: GPE	Mainly manufacture of carbon black; Production of rubber, paints, cosmetics	NPRI 2006: Not found TradeMap: For 'carbon black & other forms of carbon': Imported 115000 tonnes; exported 125000 tonnes IC: 9 companies Challenge: Batch 12 CSI: 1 supplier CCOHS: 60 MSDS Workplace measurements: 125 (ON); 61 (BC)	Group B
Carbon tetrachloride (tetrachloromethane)	IARC 2B Hepatotoxin; neurotoxin CEPA Toxic 'c' (human health) HC: Already risk managed	Laboratory solvent; Industrial solvents and cleaners; Chemical intermediate	CAREX: ~5 exposed (ON); 0 (BC) NPRI 2006: 2 companies (0.3 tonne) TradeMap: Imported 123 tonnes; none exported IC: 3 companies CCOHS: 21 MSDS Workplace measurements: 122 (ON); 240 (BC)	Group B: Declining use, but workplace exposures still taking place in Canada.
Catechol (1,2-benzenediol)	IARC 2B CNS depressant; eczema; dermatitis CEPA: No HC: IPE	Rubber manufacture; Production of insecticides; Production of dyes; Printing and paper processing; Metal plating and coal processing	NPRI 2006: 1 company (0.005 tonne) TradeMap: Not found IC: Not found Challenge: Batch 1 CSI: 1 supplier CCOHS: 12 MSDS Workplace measurements: None	Group B: Variety of potential workplaces.

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Chlorinated paraffins, average length C12 and ~60% chlorination (short-chain chlorinated paraffins, or SCCP)	IARC 2B Relatively non-toxic CEPA: PSL1 HC: Already risk managed	Production and use of metalworking fluids; Production of plastics (CPs used as flame retardants & plasticizers)	NPRI 2006: Not found TradeMap: Not found IC: 2 companies CSI: No CCOHS: None found (many for 'paraffin') Workplace measurements: 44 (BC - 'paraffin wax fume').	Group B: Potential for exposure to machinists and many other workers.
Chloroform (trichloromethane)	IARC 2B CNS depressant CEPA: PSL2 HC: Already risk managed	Mainly pulp & paper mill workers; Production of refrigerants; During pesticide manufacture	NPRI 2006: 13 companies (68 tonnes) TradeMap: Imported 36 tonnes; exported 14 tonnes IC: Not found CSI: 1 supplier CCOHS: 112 MSDS Workplace measurements: 113 (ON); 193 (BC)	Group A: Variety of workplaces; workplace samples available.
Chloroprene (2-chloro-1,3-butadiene. Polymerized it is called chloroprene rubber, or neoprene)	IARC 2B CNS depressant; reproductive toxin CEPA: No HC: LPE	During polychloroprene (neoprene) production	NPRI 2006: Not found TradeMap: For 'chloroprene latex': Imported 473 tonnes; exported 98 tonnes IC: Not found, but 36 companies for 'neoprene', and chloroprene rubber is found under the synthetic resins NAICS code. CSI: No CCOHS: 1 MSDS Workplace measurements: 13 (ON)	Group B: Most information is on neoprene (polymerized). Further investigation needed.

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Coal-tar and coal-tar pitches	IARC 1 Severe eye and skin problems CEPA: No HC: GPE	Production of refined chemicals (i.e. creosotes, pharmaceuticals); During steel and aluminum smelting; Roofing and paving; Petroleum refining	CAREX: Yes, but under PAHs NPRI 2006: Not found TradeMap: For 'pitch obtained from coal-tar': none imported; exported 59000 tonnes. For 'products made by the distillation of coal-tar': Imported 53000 tonnes; exported 282000 tonnes. IC: 6 companies CSI: No CCOHS: 1 for coal-tar pitch; 4 for coal-tar; 18 for products containing coal-tar Workplace measurements: For coal-tar pitch: 459 (ON)	Group A
Creosotes	IARC 2A Severe skin problems; irritant; eye problems CEPA: Yes, paragraph 'a' HC: LPE	Registered in 7 heavy-duty wood preservatives by the PMRA. Use: BC: 2200 tonnes in 2003, 5400 tonnes in 1999; Wood preservation; Workers who use treated wood; Roofers, chemical manufacturers	CAREX: Yes, but under PAHs NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: 7 MSDS Workplace measurements: None	Group A: Varied use; extensive use in BC
Dichloromethane (methylene chloride; DCM)	IARC 2B CNS depressant, skin/lung irritant, mutagen CEPA Toxic 'c' (human health) HC: Already risk managed	Manufacture/use of paint removers; Plastics and foam manufacture; Industrial cleaning	CAREX: 3000 exposed (ON); 500 (BC) NPRI 2006: 61 companies (361 tonnes) TradeMap: Imported 3600 tonnes, exported 375 tonnes IC: 3 companies CCOHS: 141 MSDS Workplace measurements: 4307 (ON); 1031 (BC); 3204 (PQ)	Group A

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Diesel fuel, marine	IARC 2B Skin irritant; skin ulceration; lung damage; renal failure and GI symptoms after acute exposure CEPA: No HC: GPE	Mainly in fuel refining; Marine industry (maintenance and operation)	NPRI 2006: Not found TradeMap: Not found IC: 58 companies for 'diesel fuel'; 0 for 'marine diesel fuel' CSI: No CCOHS: 7 MSDS Workplace measurements: None	Group B: prioritized by Health Canada
Disperse Blue 1	IARC 2B Health effects not located CEPA: No HC: LPE	To hairdressers (found in some hair dyes); Manufacture of dyes or personal products	NPRI 2006: Not found TradeMap: For 'synthetic organic disperse dyes': Imported 820 tonnes; exported 91 tonnes. IC: Not found CSI: No CCOHS: None found Workplace measurements: None	Group B: Exposures likely limited, but could be Group A for hairdressers
Epichlorohydrin (chloromethyl oxirane)	IARC 2A Skin burns; sensitization; bronchial asthma; dermatitis CEPA: No HC:GPE	Production of epoxy resins, synthetic glycerin and elastomers; Via its use to cure propylene-based rubbers	CAREX: 500 exposed (ON); 100 (BC) NPRI 2006: Yes, but no releases since 2003 (0.002 tonne) TradeMap: Imported 55 tonnes; exported 22 tonnes IC: Not found Challenge: Batch 2b CSI: 1 supplier CCOHS: 7 MSDS Workplace measurements: 218 (ON); 7 (BC)	Group A: Workplace samples available; likely in wide use in epoxy resin industry

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Ethyl acrylate (acrylic acid ethyl ester)	IARC 2B Potent irritant; CNS depressant CEPA: n/a HC: GPE	Manufacture of ethyl acrylate; Manufacture and use of acrylic resins	NPRI 2006: 6 companies (0.134 tonne) TradeMap: 'Acrylic acid esters': Imported 40000 tonnes; exported 495 tonnes IC: No, but for 'acrylic resin': 16 companies Challenge: Batch 11 CSI: No CCOHS: 4 MSDS Workplace measurements: 69 (ON); 2 (BC)	Group B
Ethylbenzene	IARC 2B Irritant; CNS disorders; hepatotoxin CEPA: No HC: GPE	Production of styrene foam; During petroleum refining; Production and use of coatings and paints	NPRI 2006: 284 companies (1200 tonnes) TradeMap: Imported 117 tonnes; none exported IC: 3 companies (2 of which do remediation) CSI: 1 supplier and 2 producers. 5 main producers of styrene as well. CCOHS: 22 MSDS Workplace measurements: 452 (ON); 1374 (BC); 3589 (PQ)	Group A
Ethylene oxide	IARC 1 Irritant; CNS depressant; irritant-induced asthma CEPA: Yes, paragraph 'c' HC: Already risk managed	Ethylene oxide production; Manufacture of end products (especially ethylene glycol); Use in hospitals and industrial sterilization	CAREX: 40 exposed (ON); 20 (BC) NPRI 2006: 9 companies (18 tonnes) TradeMap: Imported 4100 tonnes; exported 5500 tonnes IC: Not found CSI: 1 supplier CCOHS: 79 MSDS Workplace measurements: 4094 (ON); 769 (BC)	Group A

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Formaldehyde	IARC 1 Irritant; respiratory symptoms; nasal problems; dermatitis CEPA: Yes, paragraphs 'b' and 'c' HC: Already risk managed	Wood and furniture production (glues and veneers); During resin synthesis; Via use as a fumigant in agriculture; Exposure via combustion	CAREX: 32000 exposed (ON); 10000 (BC) NPRI 2006: 172 companies (2336 tonnes) TradeMap: Imported 13400 tonnes; exported 9700 tonnes IC: 30 companies CSI: 4 suppliers CCOHS: 87 MSDS Workplace measurements: 7921 (ON); 3384 (BC); 4629 (PQ)	Group A
Fuel oils, residual (heavy)	IARC 2B CNS depressant; kidney damage CEPA: No HC: GPE	During production, storage, distribution and use; Marine transportation	NPRI 2006: Not found TradeMap: Not found IC: 28 companies for 'fuel oils' CSI: No suppliers CCOHS: 6 MSDS Workplace measurements: None	Group B: produced extensively in Canada.
Furan	IARC 2B CNS depressant; GI symptoms CEPA: No HC: LPE	During production of furan; Combustion byproduct	NPRI 2006: Not found TradeMap: Not found IC: 3 companies under 'tetrahydrofuran' CSI: 1 supplier of tetrahydrofuran CCOHS: 6 MSDS (2 relevant) Workplace measurements: None	Group B
Gasoline	IARC 2B Eye irritant; CNS depressant; skin problems; death at high exposures CEPA: No HC: LPE	Driving of gasoline tanker trucks; At bulk loading terminals; Via spills and leaks; At refineries and service stations	NPRI 2006: Not found TradeMap: Not found IC: 16 companies CSI: No CCOHS: 208 MSDS Workplace measurements: 147 (ON); 116 (BC)	Group B: workplace samples available

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Hexachloroethane	IARC 2B Irritant; liver and kidney damage; CNS depressant CEPA: No HC: LPE	Chemical manufacture; Aluminum production	NPRI 2006: In 2005, 1 company (0.001 tonne) TradeMap: Not found IC: Not found CSI: No CCOHS: 1 MSDS Workplace measurements: 26 (ON); 4 (BC)	Group B
Hydrazine	IARC 2B Severely corrosive and causes burns and dermatitis; respiratory irritant; CNS depressant; kidney and liver damage CEPA: No HC: IPE	During production; Waste during nuclear power generation; As corrosion inhibitor; Cigarette smoke	NPRI 2006: 4 companies (2 tonnes) TradeMap: For 'hydrazine and hydroxylamine and their inorganic salts': Imported 431 tonnes; no export data available IC: 5 companies CSI: 1 supplier CCOHS: 56 MSDS Workplace measurements: 2 (ON); 4 (BC)	Group B: probably geographically limited, but may still be exposures.
Isoprene	IARC 2B Irritant; CNS depressant CEPA: No HC: GPE	During synthetic rubber production; Combustion byproduct (traffic, wood smoke, etc.)	NPRI 2006: 3 companies (15 tonnes) TradeMap: For 'buta-1,3-diene and isoprene': imported 15773 tonnes; exported 64998 tonnes IC: 1 company Challenge: Batch 2 CSI: 1 supplier CCOHS: 9 MSDS Workplace measurements: None	Group B: varied exposures sources, rubber industry important

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Mineral oils, untreated and mildly treated	IARC 1 Irritant; lipid pneumonia; respiratory and skin symptoms; lung diseases CEPA: No HC: n/a	Manufacture of automobiles, airplanes and parts, steel products; Engine repair; Exposures during machining (mineral oil mists)	CAREX: Included under PAH listing NPRI 2006: Not found TradeMap: Not found IC: 25 companies CSI: No CCOHS: 149 MSDS for 'mineral oil'; unclear how many are untreated Workplace measurements: 721 (BC: 'mineral oil mist')	Group B: Exposures more likely for refined oils now - could be subsets of workers exposed.
Naphthalene	IARC 2B Skin rashes; blood problems; neuropathy and chronic renal failure CEPA: No HC: GPE	Metal processing; Petroleum refining; Fossil fuel combustion; Production for labs/mothballs	NPRI 2006: 80 companies (480 tonnes) TradeMap: imported 8587 tonnes; exported 10659 tonnes IC: 5 companies Challenge: Batch 1 CSI: No CCOHS: 32 MSDS Workplace measurements: 166 (ON); 47 (BC)	Group A
Nitrilotriacetic acid & its salts (NTA)	IARC 2B Irritant; causes pain; coughing; dyspnea; gastrointestinal irritation (if ingested); kidney and genetic damage CEPA: No HC: IPE	During detergent formulation; Manufacture of the compound or its salts; During water treatment; During other production procedures in which the compound is used	NPRI 2006: 7 companies (6 tonnes) TradeMap: Not found IC: Not found Challenge: Batch 8 CSI: 1 supplier CCOHS: 3 MSDS Workplace measurements: None	Group B
Nitrobenzene	IARC 2B Extremely toxic: blood problems; dyspnea; weakness; hepatotoxin; coma; potentially death CEPA: No HC: LPE	Aniline production, shipping, lab testing; Exhaust inhalation	NPRI 2006: Nothing recorded since 1994 TradeMap: Not found IC: 1 company (remediation) CSI: 1 supplier CCOHS: 15 MSDS (12 are relevant) Workplace measurements: None	Group A: One of the largest producers in the world is in Canada; extremely toxic

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Nitromethane ('nitro')	IARC 2B Irritant; dermatitis; CNS depressant CEPA: No HC: IPE	Inhalation or dermal contact of vehicle fuel or engine exhaust (combustion byproduct); Lab technicians; Pesticide production (Picrin)	NPRI 2006: Not found TradeMap: Not found IC: 1 company Challenge: Batch 9 CSI: 1 supplier CCOHS: 8 MSDS Workplace measurements: 86 (ON)	Group B: Workplace exposures likely limited, except when as a combustion byproduct.
N-Nitrosodiethanolamine	IARC 2B No non-carcinogenic information found. CEPA: No HC: n/a	During exposure to metal working fluids and production of cosmetic products	NPRI 2006: Not found TradeMap: Not found IC: No CSI: No CCOHS: None Workplace measurements: 28 listed under "N-nitrosamines" (ON)	Group B: Contamination of soluble MWF still likely.
N-Nitrosodiethylamine	IARC 2A Other health effects not noted CEPA: Yes, paragraph 'c' HC: LPE	Via its use in synthetic fibre and rubber manufacture	CAREX: 250 exposed (ON); 50 (BC) NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: None Workplace measurements: 156 (PQ)	Group B
N-Nitrosodi-n-butylamine	IARC 2B No non-carcinogenic information found. CEPA: No HC: n/a	During rubber production (byproduct - not commercially produced)	NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: None Workplace measurements: 28 for "N-nitrosamines" (ON); 156 (PQ)	Group B: based on recent workplace samples alone. Downgrade if no exposures found.

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Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
N-Nitrosodi-n-propylamine	IARC 2B No non-carcinogenic information found CEPA: No HC: n/a	During rubber production; Handling of contaminated herbicides	NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: None Workplace measurements: 28 for "N-nitrosamines" (ON); 156 (PQ)	Group B: based on recent workplace samples alone. Downgrade if no exposures found.
N-Nitrosomorpholine	IARC 2B No non-carcinogenic information found CEPA: No HC: n/a	During rubber manufacture	NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: None Workplace measurements: 156 (PQ)	Group B: based on recent workplace samples alone. Downgrade if no exposures found.
N-Nitrosopiperidine	IARC 2B Eye irritant (pigmented area and cornea), reduce vision; liver damage (with prolonged exposure) CEPA: No HC: n/a	During rubber manufacture	NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: None Workplace measurements: 156 (PQ)	Group B: based on recent workplace samples alone. Downgrade if no exposures found.
N-Nitrosopyrrolidine	IARC 2B No non-carcinogenic information found CEPA: No HC: n/a	During rubber manufacture	NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: No CCOHS: None Workplace measurements: 156 (PQ)	Group B: based on recent workplace samples alone. Downgrade if no exposures found.
o-Anisidine	IARC 2B Skin irritant and sensitizer; headache; vertigo CEPA: No HC: LPE	Dye manufacture; Steelworks (corrosion inhibitor)	NPRI 2006: Not found TradeMap: For 'anisidines and dianisidines': Imported 77 tonnes; none exported IC: Not found CSI: 1 supplier CCOHS: None Workplace measurements: None	Group B: Imported, but needs further investigation into potential Canadian uses.

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Priority Occupational Carcinogens for Surveillance in Canada

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
p-Chloroaniline	IARC 2B Blood problems (acute exposure) CEPA: No HC: LPE	Manufacture of pesticides, household products and dyes	NPRI 2006: Not found TradeMap: Not found IC: Not found CSI: 2 suppliers CCOHS: None Workplace measurements: None	Group B: Information very limited, but there are 2 suppliers
Polychlorinated biphenyls (PCBs)	IARC 2A Irritant; blood problems; rashes; conjunctivitis; GI symptoms CEPA: Yes, paragraphs 'a', 'b', and 'c' HC: Already risk managed	Although no longer widely used, common hazardous waste (exposure to clean-up crews); Laboratory research	CAREX: 100 exposed (ON); 35 (BC) NPRI 2006: Not found TradeMap: Not found IC: 6 companies (remediation & research) CSI: No CCOHS: 50 MSDS Workplace measurements: 168 (ON); 499 (BC)	Group A: Workplace samples available; high public interest
Potassium bromate	IARC 2B Irritant; kidney and liver damage CEPA: No HC: IPE	Chemical production; Use in laboratory environments (?)	NPRI 2006: Yes but no reports on record TradeMap: Not found IC: Not found CSI: 1 supplier CCOHS: 12 MSDS Workplace measurements: None	Group B: Classified as IPE, but Canadian uses not located.
Propylene oxide (PO; methyl oxirane)	IARC 2B CNS depressant; irritant CEPA: No HC: GPE	During manufacture of polyurethane and polypropylene glycol; Paint, lubricant, oils manufacture	NPRI 2006: 1 company (0.04 tonne) TradeMap: Imported 50000 tonnes; no export data available IC: 180 for "polyurethane" CSI: 1 supplier Challenge: Batch 1 CCOHS: 17 MSDS Workplace measurements: 159 (ON)	Group B: GPE, likely used in many workplaces in Canada, but expect closed system

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Styrene	IARC 2B Neurotoxin, skin/lung irritant, 'styrene sickness' CEPA: Priority Substances List 1 (not CEPA toxic) HC: Already risk managed	Manufacture of styrene; Plastics and rubber production; Emitted from photocopying machines	CAREX: 17000 exposed (ON); 2200 (BC) NPRI 2006: 130 companies (2900 tonnes) TradeMap: Imported ~30000 tonnes; exported 0.5 million tonne IC: 34 companies CSI: 1 supplier CCOHS: 34 MSDS Workplace measurements: 5995 (ON); 1930 (BC); 4608 (PQ)	Group A: Many workers exposed; samples available
Styrene 7,8-oxide (styrene oxide)	IARC 2A Skin irritant or sensitizer CEPA: No HC: LPE	Manufacture of transport equipment; Treatment of fibres and textiles (used in epoxy resins)	CAREX: 1800 exposed (ON); 400 (BC) NPRI 2006: Yes but no release since 1998 (3 companies, 0.343 tonne) TradeMap: Not found IC: Not found CSI: 1 supplier CCOHS: 1MSDS Workplace measurements: None	Group B: Exposures probably occurring, but likely at low levels
Tetrachloroethylene (perchloroethylene; PERC)	IARC 2A Dermatitis; irritant; CNS depressant; liver and kidney damage CEPA: Yes, paragraph 'a' HC: Already risk managed	Industrial cleaners; Printing industry (used in inks); Textile manufacture	CAREX: 9400 exposed (ON); 1400 (BC) NPRI 2006: 39 companies (88 tonnes) TradeMap: Imported 6976 tonnes; exported 127 tonnes IC: 5 companies CSI: 1 supplier CCOHS: 12 MSDS Workplace measurements: 2753 (ON); 2710 (BC)	Group A
Tetrafluoroethylene	IARC 2B Respiratory irritant CEPA: No HC: LPE	Production of Teflon® and nitroso rubbers	NPRI 2006: Not found TradeMap: 'poly-tetrafluoroethylene': imported 496 tonnes; exported 8 tonnes IC: 74 companies for "Teflon®" CSI: 1 supplier CCOHS: None Workplace measurements: None	Group B: Teflon® is likely produced in Canada - could lead to TFE exposure

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Toluene diisocyanates	IARC 2B Potent cause of occupational asthma; loss in lung function; hypersensitivity pneumonitis CEPA: No HC: GPE	During polyurethane foam manufacture and use; Using isocyanate paints; Resin workers, insulators, wire coatings workers, textile processing	NPRI 2006: 2,4-TDI: 6 companies (2.2 tonnes); 2,6-TDI: 5 companies (0.2 tonne); 'TDI-mixed isomers': 23 companies (3.7 tonnes) TradeMap: 'isocyanates': imported 31769 tonnes; exported 455 tonnes IC: 5 companies for 'isocyanate'; 179 for 'polyurethane'; 71 for 'polyurethane foam'. Challenge: Batch 1 CSI: No CCOHS: 1 MSDS; 10 under "TDI" Workplace measurements: 2466 (ON); 385 (BC); 420 (PQ)	Group A: GPE, high use chemical, very toxic
Vinyl acetate (acetic acid ethenyl ester)	IARC 2B Lung function problems; heart muscle deterioration; irritant CEPA: No HC: GPE	During VA production or production of paints, adhesives, resins, food packaging	NPRI 2006: 16 companies (200 tonnes) TradeMap: Imported 53852 tonnes; exported 88 tonnes IC: 2 companies Challenge: Batch 2 CSI: 1 supplier CCOHS: 33 MSDS Workplace measurements: 116 (ON)	Group B: Deserves further attention: still used and produced in Canada (chemical industry)
Vinyl chloride	IARC 1 Reduced circulation; scleroderma; CNS depressant; liver damage CEPA: Yes (paragraph not noted) HC: Already risk managed	Manufacture of polyvinyl chloride (PVC) and products; Manufacture of chemicals for the petroleum industry	CAREX: 900 exposed (ON); 0 (BC) NPRI 2006: 7 companies (7 tonnes) TradeMap: Imported 290000 tonnes; exported 13000 tonnes. PVC trade data also available. IC: 6 companies CSI: None listed, but there is at least 1 supplier CCOHS: 7 MSDS Workplace measurements: 132 (BC)	Group B: Likely used in a closed system, however could be investigation further

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Industrial chemicals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Trichloroethylene (TCE)	IARC 2A Dermatitis; irritant; CNS depressant; liver and kidney damage CEPA: Yes, paragraphs 'a' and 'c' HC: Already risk managed	Dry-cleaning workers; Anywhere it is used as a metal degreaser (metal products, automotive, electronics manufacture, furniture and fixtures); Via use as a chemical intermediate	CAREX: 4300 exposed (ON); 900 (BC) NPRI 2006: 49 companies (710 tonnes) TradeMap: Export 11 tons; Import 1700 tons IC: 9 companies CSI: 1 supplier CCOHS: 32 MSDS Workplace measurements: 1292 (ON); 542 (BC); 1695 (PQ)	Group A

Metals

Carcinogen (Metals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Antimony trioxide	IARC 2B Pneumoconiosis; respiratory irritant; reproductive toxin CEPA: No HC: GPE	During recovery from lead-zinc batteries; lead smelting; Textile manufacture (flame retardant)	NPRI 2006: 56 companies (127.5 tonnes) (as 'antimony & compounds') TradeMap: Imported 2069 tonnes; exported 88 tonnes IC: 11 companies CSI: 1 supplier Mines/smelters: No operational mines, 4 lead smelters CCOHS: 19 MSDS Workplace measurements: 396 (ON)	Group A

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Metals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Arsenic and arsenic compounds (As)	IARC 1 Extreme skin problems; GI symptoms; liver and kidney damage CEPA: Yes, paragraphs 'a' and 'c' HC: Already risk managed	Mostly via the use of arsenical pesticides (used to treat wood); Secondary wood production (exposures from arsenic-treated wood); Via smelting of zinc, copper, nickel, lead. Steel founding	CAREX: 5200 exposed (ON), 3200 (BC) NPRI 2006: 220 companies (533 tonnes) TradeMap: 'Arsenic sulfides, alunite, pozzolana and other mineral substances': Imported 18000 tonnes; exported 312000 tonnes IC: 1 company CSI: 1 supplier Mines/smelters: Not specifically, but As found in tailings of lead-zinc, copper, gold mines. As is inadvertently released from base metal smelters. CCOHS: 112 MSDS Workplace measurements: 612 (ON); 1735 (BC)	Group A
Beryllium and beryllium compounds	IARC 1 Chronic beryllium disease; other lung problems; severe skin problems; organ damage CEPA: No HC: LPE	Manufacture of industrial machinery and other metal products; Transport equipment manufacture (i.e. air travel) Petroleum production	CAREX: 1500 exposed (ON); 300 (BC) NPRI 2006: Not found TradeMap: 'unwrought beryllium; powders of beryllium; beryllium waste and scrap': None Imported; exported 3 tonnes. USGS references suggest higher numbers (Imported 18 tonnes, Exported 14 tonnes) IC: 8 Companies CSI: No Mines/smelters: None noted CCOHS: 76 MSDS Workplace measurements: 292 (ON); 521 (ON); 17864 (PQ)	Group A

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Metals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Cadmium and cadmium compounds	IARC 1 Pulmonary effects; blood problems; reproductive toxin CEPA: Yes, paragraphs 'a' and 'c' HC: Already risk managed	Construction involving sewers, pipelines and power lines; Paint removal by grinding & painting of cars with cadmium containing paints; Working in zinc metallurgical plants; Battery plants; Welding fumes	CAREX: 8100 exposed (ON); 2100 (BC) NPRI 2006: 358 companies (350 tonnes) TradeMap: 'Cadmium and articles thereof': Imported 96 tonnes; exported 2600 tonnes IC: 41 companies; 1310 companies for 'welding' CSI: 1 supplier for 'cadmium metal' Mines/smelters: Cd is a byproduct of zinc mining (9 operational mines), and is produced at all 4 zinc plants in Canada. CCOHS: 214 MSDS Workplace measurements: 1358 (ON); 3348 (BC); 662 (PQ) (+ for welding fumes: 432 (ON), 2391 (BC), 6652 (PQ))	Group A
Chromium VI (hexavalent chromium)	IARC 1 Pneumoconiosis; skin problems; irritant CEPA: Yes, paragraphs 'a' and 'c' HC: No	Printing and metals industries; Welding of stainless steel; Sheet metal workers; Spray painters using chromium paints; Pesticide workers (the PMRA lists 5 chromic acid products as registered in Canada)	CAREX: 40000 exposed (ON); 9600 (BC) NPRI 2006: 257 companies (232 tonnes) TradeMap: 'Chromium ores and concentrates': Imported 15000 tonnes; exported 4900 tonnes. For 'chromium oxides and hydroxides': Imported 2000 tonnes; exported 260 tonnes. 'Chromium and articles thereof': Imported 660 tonnes; exported 16 tonnes IC: 3 companies CSI: 1 supplier listed for hexavalent chromium, but hundreds of other compounds also noted. Mines/smelters: No current chromite mining CCOHS: MSDS Workplace measurements: 1699 (ON); 3522 (BC); 560 (PQ)	Group A

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Carcinogen (Metals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Cobalt and cobalt compounds (2B), and cobalt with tungsten carbide (2A)	IARC 2B Skin reactions; asthma and other lung diseases CEPA: No HC: GPE	During mining, processing and use, and in porcelain painting; Combustion byproduct (vehicle exhaust, burning of fossil fuels)	CAREX: 9000 (ON); 2200 (BC) NPRI 2006: 68 companies (150 tonnes) TradeMap: 'Cobalt oxides': imported 50 tonnes; 'Cobalt chloride': imported 56 tonnes; 'Cobalt acetate': imported 64 tonnes; 'cobalt mattes... and other cobalt products': imported 2200 tonnes; exported 7700 tonnes IC: 47 companies for 'cobalt' CSI: 1 supplier for 'cobalt metal' Mines/smelters: 5 mines, 2 smelters / refineries, 1 recycling plant CCOHS: 280 MSDS Workplace measurements: 1260 (ON), 2029 (BC), 897 (PQ)	Group A
Gallium arsenide	IARC 1 Eye and respiratory irritant CEPA: No HC: Additional substance for consideration post-2006	Workers in the microelectronics industry (to make light-emitting diodes); Used in solar cells	NPRI 2006: Not found TradeMap: Not found IC: 2 companies, and 9 for 'solar cells' CSI: No Mines/smelters: No mines; gallium recycling is done by 1 company CCOHS: 3 MSDS Workplace measurements: None	Group B
Indium phosphide	IARC 2A Nervous system problems; tooth decay; joint pain CEPA: No HC: No	Microelectronics workers; Solar cell manufacture	NPRI 2006: Not found TradeMap: Not found IC: 9 companies for 'solar cells' Mines/smelters: None found CCOHS: 2 MSDS Workplace measurements: 19 (BC)	Group B: Likely limited exposures, but some workplace samples.

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Metals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Lead (2B) and lead compounds (2A)	IARC 2A and 2B Neurotoxin; nephrotoxin; reproductive toxin; hypertension CEPA: Yes, paragraph 'c' HC: Already risk managed	Manufacture/processing; Lead-acid battery production and recycling; Laboratory use and lead pigments	CAREX: 73600 (ON); 20700 (BC) NPRI 2006: 673 companies (7900 tonnes) TradeMap: 'lead ores and concentrates': imported 41270 tonnes; 'lead, refined unwrought': imported 3319 tonnes; exported 164000 tonnes (Many other entries) IC: 457 companies CSI: 1 supplier Mines/smelters: 2 mines, 5 plants CCOHS: 562 MSDS Workplace measurements: 7806 (ON); 25441 (BC); 3459 (PQ)	Group A
Methylmercury compounds (MeHg)	IARC 2B Severe neurotoxin (developmental and prenatal) CEPA: Only mercury listed; paragraph 'c'. HC: No	Likely limited; potentially fluorescent bulb production; Chlor-alkali production; Laboratory technicians	NPRI 2006: For 'mercury and its compounds': 276 companies (60000 kg). MeHg likely small proportion. TradeMap: For 'mercury': imported 11 tonnes; exported 8 tonnes IC: For 'mercury' over 100 companies; 'fluorescent bulbs' 15 companies CSI: 1 supplier for 'phenylmercury acetate' Mines/smelters: None operational CCOHS: 8 MSDS (compounds) Workplace measurements: 28 (ON) for 'mercury - alkyl compounds'	Group B

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Metals)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Nickel (2B) & its compounds (1)	IARC 1 & 2B Skin effects; chronic bronchitis CEPA: Nickel compounds: paragraph 'a' HC: Already risk managed	Mining, refining, smelting; Electroplating and battery manufacturing; Reclamation, recycling and disposal of nickel compounds	NPRI 2006: 318 companies (1920 tonnes) TradeMap: For 'nickel ores and concentrates': Imported 7800 tonnes; exported 1000 tonnes (many other entries as well) IC: For 'nickel': 236 companies CSI: 445 hits for nickel; likely many Canadian. Mines/smelters: 11 mines, 3 refineries, 3 smelters CCOHS: 535 MSDS Workplace measurements: 2618 (ON); 2709 (BC); 428 (PQ)	Group A
Titanium dioxide	IARC 2B Respiratory toxin; lowered lung function CEPA: No HC: GPE	During mining, milling and production; During use as a pigment in cosmetics, paints, enamels	NPRI 2006: Not found TradeMap: For 'titanium pigments >80% TiO ₂ ': Imported 85992 tonnes; exported 81189 tonnes. For 'titanium pigments < 80% TiO ₂ ': exported 2306 tonnes, imported 4536 tonnes IC: 2 companies (1 produces TiO ₂ itself, other produces TiO ₂ coatings) CSI: 1 supplier Mines/smelters: 1 mine CCOHS: 35 MSDS Workplace measurements: 88 (ON)	Group B
Vanadium pentoxide	IARC 2B Respiratory and skin irritant CEPA: No HC: GPE	Cleaning of fossil fuel burning furnaces; Vanadium mining, petroleum refining; production/refining of iron ores; Ceramics industry (pigments)	NPRI 2006: 62 companies (1750 tonnes) TradeMap: For 'vanadium oxides': Imported 777 tonnes; exported 3 tonnes IC: Not found CSI: 1 supplier Mines/smelters: None at present time CCOHS: 8 MSDS Workplace measurements: 319(ON); 141 (BC)	Group A

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Pesticides

Carcinogen (Pesticides)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
1,3-Dichloropropene (Telone)	IARC 2B Irritant and sensitizer CEPA: No HC: No	During pesticide application, manufacture and transport; Used as a soil fumigant for root rot, and a nematocide for a wide variety of crops.	NPRI 2006: Not found PMRA: 4 formulations IC: Not found CSI: None known CCOHS: None found Workplace measurements: None	Group B
2,4-D	IARC 2B Irritant; CNS and GI toxin CEPA: No HC: LPE	During pesticide application, manufacture and industrial accidents; Primarily used on cereal crops, but allowed on many others	NPRI 2006: Not found PMRA: 2,4-D (and its acids and esters) 180 products IC: Not found CSI: None found CCOHS: 'Chlorophenoxy': 1 MSDS; '2,4-D': 49 MSDS Workplace measurements: 16 (ON)	Group A
2,4-DP (dichlorprop)	IARC 2B Irritant; CNS and GI toxin CEPA: No HC: No	During pesticide application, manufacture and industrial accidents; Primarily used on cereal crops, also orchards	NPRI 2006: Not found PMRA: 18 formulations IC: Not found CSI: None found CCOHS: 'Chlorophenoxy': 1 MSDS; 'dichlorprop': 3 MSDS Workplace measurements: None	Group B
Chlorothalonil	IARC 2B Dermatitis; photosensitization; eye irritant CEPA: No HC: LPE	During application (farmers, applicators, tree planters), manufacture and distribution Contact with treated wood (cabinetry, wood processing); Allowed on many crops: fruits, vegetables, cereals, etc.	NPRI 2006: Not found PMRA: 15 formulations IC: Not found CSI: None found CCOHS: None found Workplace measurements: 3459 (PQ)	Group A

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Priority Occupational Carcinogens for Surveillance in Canada

Carcinogen (Pesticides)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
Dichlorvos	IARC 2B Neurotoxin CEPA: No HC: LPE	During production and application; manufacture of products (i.e. flea collars); To veterinarians who use it on animals; Not used on crops, mostly in food storage areas	NPRI 2006: Not found PMRA: 13 products IC: Not found CSI: None found CCOHS: 1 MSDS Workplace measurements: 26 (ON)	Group B
Hexachlorobenzene	IARC 2B Hepatotoxin; neurotoxin; skin problems CEPA: Yes, paragraphs 'a' and 'c' HC: Already risk managed	During production of chlorinated hydrocarbons, aluminum casting, waste burning; No longer used on crops	NPRI 2006: 335 companies (24 kg) PMRA: No IC: Not found CSI: 1 supplier CCOHS: 2 MSDS Workplace measurements: None	Group B
Lindane (hexchloro-cyclohexanes)	IARC 2B CNS depressant; hepatotoxin; nephrotoxin CEPA: Schedule 3 (export control list) HC: LPE	Potentially during production of topical formulations; Home use products (shampoo)	NPRI 2006: Not found PMRA: No; last 9 products deregistered in 2004 IC: 2 companies CSI: None found CCOHS: 1 MSDS Workplace measurements: 7 (ON)	Group B
MCPA	IARC 2B Irritant; CNS and GI toxin CEPA: No HC: No	During pesticide application, manufacture and industrial accidents; Mostly used on cereals, also aquatic weeds	NPRI 2006: Not found PMRA: 88 formulations IC: Not found CSI: None found CCOHS: 'Chlorophenoxy': 1 MSDS; 'MCPA': 23 MSDS Workplace measurements: None	Group A

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Pesticides)	Carcinogenicity & Toxicity	Potential exposure circumstances (occupational)	Evidence of use/exposure	Priority
MCPP (mecoprop)	IARC 2B Irritant; CNS and GI toxin CEPA: No HC: No	During pesticide application, manufacture and industrial accidents; Mostly used on cereal crops	NPRI 2006: Not found PMRA: 102 formulations IC: Not found CSI: None found CCOHS: 'Chlorophenoxy': 1 MSDS; 'MCPP': 2 MSDS; 'Mecoprop': 4 MSDS Workplace measurements: None	Group A
p-Dichlorobenzene	IARC 2B Irritant; hepatotoxin; CNS depressant CEPA: Priority Substance List 1 HC: Already risk managed	During manufacture of pDCB and metal manufacturing (byproduct); To industrial cleaners/janitors; Fumigant and moth repellent	NPRI 2006: 3 companies (13 tonnes) PMRA: 9 products IC: Not found CSI: 2 suppliers CCOHS: 3 MSDS Workplace measurements: 36 (ON); 6 (BC)	Group B
Pentachlorophenol	IARC 2B Liver damage; severe acne CEPA: No HC: IPE	Wood preservation industry; During production; Used in heavy-duty wood preservation	CAREX: 1400 (ON), 800 (BC) NPRI 2006: Not found PMRA: 3 products (6 current applications) IC: 8 companies CSI: 1 supplier CCOHS: 5 MSDS Workplace measurements: 64 (ON); 1447 (BC); 0 (PQ)	Group A
Sodium orthophenylphenate (SOPP)	IARC 2B Skin, eye, and respiratory tract irritant CEPA: No HC: LPE	During production, mixing, application to products; Machinists using metal working fluids; Cleaners using antimicrobials (hospitals); Not used on crops, but in paints, glue, construction materials, etc.	NPRI 2006: None since 2003 (0.003 tonne) PMRA: 2 products (but on special review) IC: Not found CSI: None found CCOHS: None found Workplace measurements: None	Group B

CEPA = Canadian Environmental Protection Act; HC = Health Canada (GPE, IPE, LPE = greatest, intermediate, and lowest potential for exposure); CAREX = The Information System on Occupational Exposure to Carcinogens; NPRI = National Pollutant Release Inventory for 2006; TradeMap = Export Canada data for 2006; IC = Industry Canada (Canadian Company Capabilities database - # of companies); Challenge = Canadian government Challenge to Industry; CSI = Chemical Sources International (# of Canadian suppliers); CCOHS = Canadian Centre for Occupational Health and Safety (# of MSDS found); Workplace measurements = # of workplace samples collected; Mines/smelters = # of operational mines or smelters in Canada; PMRA = Pesticide Management Regulatory Agency (# of registered products). Drug Products Database = Health Canada site listing all drugs registered for use in Canada. Nurses study = "A Retrospective Cohort Study of Cancer Risks among Nurses in British Columbia: Potential Exposure to Antineoplastic Drugs" by Ward et al., 2005. Note: CNS = Central nervous system

Carcinogen (Fibres & dusts)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Asbestos	IARC 1 Asbestosis; blood problems; severe skin problems CEPA: Yes, paragraph not listed but likely 'c' HC: Already risk managed	During construction and remediation; Auto maintenance; Mining; Manufacture of asbestos products (i.e. cements, fabrics)	CAREX: 22000 exposed (ON); 7200 (BC) NPRI 2006: 69 companies (14000 tonnes) TradeMap: Imported 100 tonnes; exported 290000 tonnes; many asbestos products also listed (fabrics, cements, etc.) IC: 163 companies (mining, remediation, laboratory) CSI: 1 supplier CCOHS: 4 MSDS for fibres; 9 MSDS for asbestos cloth and rope Workplace measurements: 1787 (ON); 10968 (BC); 1385 (PQ - under 'fibres')	Group A
Crystalline silica (quartz)	IARC 1 Silicosis; bronchitis; emphysema; irritant CEPA: No HC: GPE	Mainly to construction workers (grinding, clearing land, other dusty activities); Heavy equipment operators (roads & bridges); Brick layers; Drywall and plastering; Transport of sand and gravel	CAREX: 139000 exposed (ON); 45000 (BC) NPRI 2006: Not found TradeMap: 'Silica sands and quartz sands': Imported >2 million tonnes; exported 350000 tonnes. Many other listings as well. IC: For 'quartz': 43 companies Challenge: Batch 12b CSI: No CCOHS: 7 MSDS Workplace measurements: 3495 (BC); 3373 (PQ)	Group A
Refractory ceramic fibres (RCF)	IARC 2B Irritant; lung fibrosis; pleural plaques CEPA: Paragraph 'c' HC: No	High-temperature industrial insulation applications (furnace linings, etc.); Maintenance & remediation	CAREX: 1400 exposed (ON); 300 (BC) NPRI 2006: Not found TradeMap: Refractory ceramic finished products: Imported 172000 tonnes; exported 57000 tonnes. IC: 1 company CSI: No CCOHS: 23 MSDS Workplace measurements: 114 (ON)	Group A

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Carcinogen (Fibres & dusts)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Special purpose glass fibres (such as E-glass and '475' glass fibres)	IARC 2B Irritant; lung fibrosis CEPA: No HC: No	Production of high-end filtration products, surfboards	CAREX: 31100 (ON); 8800 (BC) (for 'glass wool') NPRI 2006: Not found TradeMap: Not found IC: 11 companies under 'HEPA filter'; 25 under 'glass fibre' CSI: None known CCOHS: 'specialty glass fiber': 6 MSDS. '475 glass fiber': 2 MSDS. 'E-glass fiber': 1 MSDS Workplace measurements: 118 (ON, 'glass fibres and dust'); 17 (BC, 'glass fibres'); 31 (PQ, 'fibrous glass')	Group B
Wood dust	IARC 1 Irritant; dermatitis; respiratory problems (asthma) CEPA: No HC: No	Wood and construction; Wood processing (e.g. furniture making, etc.)	CAREX: 79000 exposed (ON); 58000 (BC) NPRI 2006: Not found TradeMap: Many wood-based products listed IC: 1 company for 'saw dust' (for fertilizer use) CSI: No CCOHS: 1 MSDS Workplace measurements: 3848 (ON); 7194 (BC) 4588 (PQ)	Group A

Radiation

Carcinogen (Radiation)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Ionizing radiation & radioactive elements	IARC 1	Working with electricity, gas & steam (nuclear power plants); Medical staff (nurses, radiation therapists, veterinarians, dentists, doctors); Instrument technicians	CAREX: 13800 exposed (ON); 10000 (BC) Workplace measurements: Yes, National Dose Registry	Group A
Magnetic fields, extremely low frequency	IARC 2B	Via electric power, especially large electric currents for fabrication; Via computer monitors, photocopiers, fluorescent lights, electric tools, etc.	Workplace measurements: Likely to find in the literature	Group A

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Carcinogen (Radiation)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Radon & its decay products	IARC 1	Exposures in underground mines (miners and service workers); Indoor workplaces where radon concentrations are high (hospitals, schools, etc.)	CAREX: 17800 exposed (ON); 300 (BC) Workplace measurements: Radon is in the National Dose Registry.	Group A
UV radiation, artificial	IARC 1	Welders and metal plate workers; Photography; Dentistry; Sterilization workers; Sunbed salon workers	CAREX: 37400 exposed (ON); 9300 (BC) Workplace measurements: Not located	Group A

Pharmacologic

Carcinogen (Pharmacologic)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
1,4-Butanediol-dimethanesulfonate (myleran; busulfan)	IARC 1	Myleran is an alkylating agent (chemotherapy drug); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 400 exposed (ON); 100 (BC) Drug Products Database: Registered for human use Nurses study: One of the less frequently used alkylating agents in BC. Overall % use in departments: oncology (17%); other (0%); pharmacy (39%).	Group B
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU; lomustine)	IARC 2A	CCNU is an anti-neoplastic drug; Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 350 exposed (ON); 120 (BC) Drug Products Database: Registered for human oral use. Nurses study: Not identified as a frequently used alkylating agent. However, overall % use in departments: oncology (17%); other (5%); pharmacy (37%).	Group B

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Carcinogen (Pharmacologic)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Adriamycin (doxorubicin)	IARC 2A	Adriamycin is a mitotic spindle inhibitor (chemotherapy drug; anti-neoplastic); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 700 exposed (ON); 250 (BC) Drug Products Database: Registered for human use, also likely manufactured in Ontario. Nurses study: One of three most frequently used mitotic spindle inhibitors in BC. Overall % use in departments: oncology (100%); other (28%); pharmacy (78%).	Group A
Bischloroethyl nitrosourea (BCNU; carmustine)	IARC 2A	BCNU is an alkylating agent (chemotherapy drug); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 200 exposed (ON); 75 (BC) Drug Products Database: Marketed for human use Nurses study: Not identified as a frequently used alkylating agent. Overall % use in departments: oncology (28%); other (5%); pharmacy (22%)	Group B
Chlorambucil	IARC 1	Chlorambucil is an alkylating agent (chemotherapy drug); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 500 exposed (ON); 300 (BC) Drug Products Database: Registered for human use Nurses study: One of the three most frequently used alkylating agents in BC. Overall % use in departments: oncology (44%); other (5%); pharmacy (80%)	Group A
Cisplatin	IARC 2A	Cisplatin is an alkylating agent (chemotherapy drug); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 700 exposed (ON); 300 (BC) Drug Products Database: Registered for human use Nurses study: One of the three most frequently used alkylating agents. Overall % use in departments: oncology (89%); other (22%); pharmacy (80%)	Group A
Cyclophosphamide (cytoxan; neosar)	IARC 1	Cyclophosphamide is an alkylating agent (chemotherapy drug); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 900 exposed (ON); 300 (BC) Drug Products Database: Registered for human use, and manufactured at 2 sites in Canada Nurses study: The most frequently used alkylating agent in BC. Overall % use in departments: oncology (100%); other (39%); pharmacy (92%)	Group A

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Carcinogen (Pharmacologic)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Melphalan (alkeran)	IARC 1	Melphalan is a chemotherapy drug; Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 700 exposed (ON); 200 (BC) Drug Products Database: Registered for human use Nurses study: One of the three most frequently used alkylating agents. However, overall % use in departments: oncology (39%); other (17%); pharmacy (72%)	Group A
Procarbazine hydrochloride	IARC 2A	Procarbazine hydrochloride is an alkylating agent (chemotherapy drug); Handling of the drug in pharmacies, hospitals, during patient handling, cleaning, waste disposal	CAREX: 300 exposed (ON); 100 (BC) Drug Products Database: Registered for human use Nurses study: Identified as an alkylating agent used in BC. Overall % use in departments: oncology (33%); other (11%); pharmacy (35%)	Group B

Microbiological

Carcinogen (Microbiological)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
<i>Helicobacter pylori</i> infection	IARC 1	Public Health Agency of Canada reports infection by <i>helicobacter pylori</i> is common in medical and veterinary settings in Canada; Potential exposure to gastroenterologists and veterinarians working in professional/technical capacity.	CAREX: 2900 exposed (ON); 900 (BC)	Group B

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Others

Carcinogen (Others)	Carcinogenicity & Toxicity	Potential exposure circumstances	Evidence of use/exposure Workplace	Priority
Polycyclic aromatic hydrocarbons (PAH) (considered as a group)	IARC varies Other health effects not noted CEPA: Yes, paragraphs 'a' and 'c' HC: Not as a group, but some individually	Vehicle exhaust; Aluminum and steel plants; Petroleum industry, etc.	TradeMap: Not found IC: Not found CSI: No CCOHS: Many for individual compounds Workplace measurements: 154 general 'PAH' (ON)	Group A
Shift work that involves circadian disruption	IARC 2A	Studies focused on nurses, flight attendants; Shift work is most prevalent in the health-care, industrial, transportation, communications, and hospitality sectors	Newly added exposure to IARC; more information to be collected	Group A
Strong inorganic mists containing sulfuric acid	IARC 1	Manufacture of metal products; Iron and steel industries; Chemical production; Manufacture of paper & paper products.	CAREX: 10200 exposed (ON); 1700 (BC)	Group A

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Appendix D: Occupational carcinogens needing further investigation (Group C)

Carcinogen	Category	IARC	Further investigation needed
1,1-Dimethylhydrazine	Industrial chemicals	2B	Low level contaminant of the pesticide Daminozide (registered for use in Canada); may be used in the production of rocket and jet fuels (unknown in Canada).
2,2-Bis(bromomethyl)propane-1,3-diol	Industrial chemicals	2B	No Canadian information found, but its main use is in the production of plastics and epoxies (important industries in Canada).
2,6-Dimethylaniline	Industrial chemicals	2B	Could be used to produce pharmaceuticals and pesticides. Group B environmental priority (metabolite of many registered anaesthetics).
2-Nitroanisole	Industrial chemicals	2B	Could be used in o-anisidine production (unsure if this occurs in Canada).
4,4'-Diaminodiphenyl ether	Industrial chemicals	2B	No Canadian information found, but it is used in polyimide manufacture.
4-Vinylcyclohexene	Industrial chemicals	2B	No Canadian information found, but used to make 1,3-butadiene, styrene polymers, and in rubber manufacture.
4-Vinylcyclohexene diepoxide	Industrial chemicals	2B	Could be used in epoxy resin production.
Acetamide	Industrial chemicals	2B	Potentially used in the plastics industry (used as a solvent and plasticizer)
Benzoyl chloride	Industrial chemicals	2A	Information limited, but it may be used to make benzoyl peroxide in Canada. At least 1 company makes benzoyl peroxide.
Chlorendic acid	Industrial chemicals	2B	May be used in epoxy resin production - if it is, occupational exposures could be limited (closed system).
Citrus Red No. 2	Industrial chemicals	2B	This dye is approved for use in Canada and the US for use on oranges (only when sold with the peel on). Extent of use needed.
Diethyl sulfate	Industrial chemicals	2A	Current uses unknown (many vague uses as a chemical intermediate, some of which may occur in Canada). Included in the Challenge to Industry.
Diglycidyl resorcinol ether	Industrial chemicals	2B	Potentially used in the production of synthetic resins.
Diisopropyl sulfate	Industrial chemicals	2B	Could be used to produce isopropanol (which is done by at least 1 Canadian company).
Dimethyl sulfate	Industrial chemicals	2A	Current uses unknown (many vague uses as an intermediate). Included in the Challenge to Industry.

Carcinogen	Category	IARC	Further investigation needed
Ethyl carbamate (urethane)	Industrial chemicals	2A	Many searches find reference to polyurethane, which ethyl carbamate is not related to. Canadian uses should be confirmed.
Glycidaldehyde	Industrial chemicals	2B	Potentially used in leather tanning.
Glycidol	Industrial chemicals	2A	Many potential uses (i.e. polymer stabilizer, pharmaceutical production, etc.), but Canadian context not located.
N-Methyl-N-nitrosourethane	Industrial chemicals	2B	Probably has limited use as a research chemical. Might be used to produce the cancer drug doxorubicin.
o-Toluidine	Industrial chemicals	2A	Could be used in the manufacture of dyes and pigments. Some export/import data located.
p-Dimethylaminoazobenzene	Industrial chemicals	2B	Likely a limited-use research chemical, but it is used in titrations.
Phenyl glycidyl ether	Industrial chemicals	2B	Potentially used in epoxy resin production in Canada.
Tris(2,3-dibromopropyl) phosphate	Industrial chemicals	2A	Exposures could occur to dry-cleaners cleaning old treated clothes.
Vinyl bromide	Industrial chemicals	2A	Newly added to the list of reportable chemicals by the Canadian Chemical Producers Association. Potentially used as a flame retardant in polymers.
Ethylene dibromide	Pesticides	2A	No longer registered for use in Canada as a pesticide, but potential use as a gasoline additive and chemical intermediate.
Polychlorophenols except penta	Pesticides	2B	Tetra is a common contaminant in penta formulations. Dichlorophenol may still be used to produce other pesticides. Canadian uses not found.
Erionite	Fibres & dusts	1	Not specifically mined in Canada, but zeolite deposits are. Could be found at low levels.
Palygorskite	Fibres & dusts	2B	Found in 3 mines in BC; allowed for use in cosmetics and pesticides in Canada, but actual use/production not located.
Talc containing asbestiform fibres	Fibres & dusts	1	Talc has many contemporary applications, but the extent to which asbestiform contamination occurs was not found.
Androgenic steroids	Pharmacologic	2A	Carcinogenic exposures likely from intentional ingestion. Should further investigate exposures in wholesale pharmacies or research labs.
Ciclosporin	Pharmacologic	1	Occupational uses not estimated (it is an immunosuppressant drug used after organ transplant). Registered for use in Canada.
Thiotepa	Pharmacologic	1	Not registered for human use in the Drug Products Database, but apparently used in BC hospitals (via the Nurses study). Further investigation into Canadian uses.

MEDIA RELEASE
FOR IMMEDIATE RELEASE: August 13, 2008

CANADA OBSTRUCTING U.N. CONVENTION OVER ASBESTOS

A U.N. Convention (the Rotterdam Convention) that protects developing countries from severely hazardous chemicals and pesticides is on its death bed due to obstruction by Canada.

Canada has obstructed the Convention by refusing to allow chrysotile asbestos to be listed as a hazardous substance, even though the Convention's expert scientific body has repeatedly called for its listing, pointing out that it meets every scientific and legal criterion in the Convention.

Listing would mean that asbestos exporting countries, such as Canada, would have to obtain prior informed consent before they could export asbestos to developing countries.

"Canada is putting the integrity of the Rotterdam Convention in jeopardy in order to protect its failing asbestos industry," said Dr. Kapil Khatter, President of the Canadian Association of Physicians for the Environment. "We in Canada have this right. Why is our government denying this right to people in developing countries? Are their lives not equally valuable?"

Canada has been the lead country to block the listing of asbestos by denying consensus with the support of Kyrgyzstan, Iran, India, Ukraine and Peru. 99% of asbestos exported around the world today is chrysotile asbestos.

"Canada's obstruction has made the Convention unworkable," said Kathleen Ruff, former director of the B.C. Human Rights Commission. "It has forced U.N. officials to circulate proposals to re-write the Convention with a complex system of dual standards and exemptions, which would be a disaster. It would gut the Convention and put commercial interests ahead of human health. This is not what Canadians want."

The expert committee's recommendation to list chrysotile asbestos will be put forward one more time at a crucial Conference in Rome October 27-31. U.N. officials and many others fear that Canada will once more refuse to allow asbestos to be listed, causing a crisis for the survival of the Convention.

"This is a tragedy for public health, a victory for the asbestos lobby and an ignoble reflection on Canada," said Geoffrey Tweedale, joint author of *Defending the Indefensible: The Global Asbestos Industry and Its Fight for Survival*.

"95% of Canada's asbestos is exported to developing countries, where it is handled by workers with few protections," said Barry Castleman, an internationally respected occupational health expert. "Canada is immorally creating a public health catastrophe in these countries"

"We call on the Canadian government to stop blocking the Convention and allow chrysotile asbestos to be listed," said Fe de Leon, Researcher of the Canadian Environmental Law Association.

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Carcinogen	Category	IARC	Further investigation needed
Hepatitis B (chronic infection)	Microbiological	1	Flag for further investigation (i.e. methodology)
Hepatitis C (chronic infection)	Microbiological	1	Flag for further investigation (i.e. methodology)
Diethylstilbestrol	Hormone	1	Registered only for veterinary use. More information on exposures needed. It is used for treating female canine incontinence.

