

**Strategies for the Reduction and Control of
Environmental Carcinogens in Canada:
What's Happening? What's Missing?**

Prepared for
Cancer Care Ontario

by

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Table of Contents	Page
Introduction	3
Strategies for the prevention of environmental cancers in Canada	4
Surveillance	4
Surveillance of confirmed cancer cases in Canada	4
Surveillance of exposures to environmental carcinogens	5
Gaps in the Canadian surveillance system	5
Right to Know Measures	6
Right to know laws in Canada	6
Right to know laws in other jurisdictions	7
Gaps in Canadian right to know measures	8
Public Education Initiatives	9
Canadian public education initiatives	9
Public education initiatives in other jurisdictions	11
Gaps in Canadian public education initiatives	11
Reduction of Carcinogens at the Source	11
Canadian source reduction initiatives	12
Source reduction initiatives in other jurisdictions	13
Gaps in source reduction initiatives	14
Legislative/Regulatory Measures	14
Legislative/regulatory measures in Canada	15
Legislative/regulatory measures in other jurisdictions	16
Gaps in legislative/regulatory measures	17
Moving Forward: Opportunities for Action on Environmental Carcinogens	17
Conclusion	19
Summary of Key Gaps, Barriers and Opportunities	20
References	22
Appendix A: List of Key Stakeholders Interviewed for Report	27

Introduction

The following report provides an overview of current practices to prevent, reduce and control exposures to environmental carcinogens in Canada. It has been prepared as a background document to guide discussion at “Cancer 2020: Focus on Cancer Prevention and the Environment”, an upcoming meeting of stakeholders concerned about preventing cancer linked to environmental exposures organized by Cancer Care Ontario.

The report reviews the strategies utilized by federal, provincial and municipal governments, industry, researchers and environmental advocacy groups to reduce or eliminate the threats to health attributable to carcinogens in the environment. These actions have been categorized into five broad strategy areas:

- surveillance
- right to know measures
- public education initiatives
- reductions of carcinogens at the source
- legislative/regulatory measures

Examples of best practices in the United States and Europe are also presented to provide a basis for comparison with Canadian efforts and to suggest other possible approaches to dealing with environmental carcinogens. Key gaps in Canadian programs, policies and infrastructure, as well as barriers to action, are also identified.

For the purposes of this report, ‘environment’ refers to the biophysical environment (i.e., air, water and soil quality). The report does not include strategies to prevent and control cancers attributable to environmental tobacco smoke or sunlight, nor does it include information on measures to prevent and control occupational carcinogens. However, the obvious links between the workplace and environmental carcinogens, many of which are the byproducts of manufacturing processes, have significant implications for remedial action.

In preparing this report, the writer is indebted to the work of the Canadian Strategy for Cancer Control, which prepared a definitive best practices review on the prevention of occupational and environmental cancers in Canada (1). The writer also acknowledges the advice and feedback from a range of key stakeholders consulted during the preparation of this document (see Appendix A).

Strategies for the Prevention of Environmental Cancers in Canada

Surveillance

Surveillance refers to the systematic collection, assessment and dissemination of data. There are two different ways of conducting cancer surveillance: the surveillance of confirmed cancer cases, and the surveillance of carcinogens (i.e., those agents that put individuals at increased risk of cancer) (1). Cancer surveillance initiatives monitor changes in the number of cases over time, and by cancer site, in order to determine how exposures to carcinogens are changing over time, while the surveillance of exposures to carcinogens is useful for evaluating who is exposed to carcinogens in order to inform attempts to reduce the risk of future cancer cases.

Surveillance of Confirmed Cancer Cases in Canada

The cancer statistics collected by provincial and territorial cancer agencies in Canada document the number of diagnosed cancer cases, the number of deaths from cancer and the place of residence at time of diagnosis or death (2). These statistics are based on information provided in hospitalization data and pathology reports (3).

In Ontario, surveillance data on cancer cases and mortality from cancer is compiled in the *Ontario Cancer Registry*, a computerized database of information on all Ontario residents who have been newly diagnosed with cancer or have died from cancer (4). All new cases of cancer are registered, with the exception of non-melanoma skin cancer. The *Cancer Act* provides the legal mandate for Cancer Care Ontario to establish and maintain the registry.

While existing surveillance mechanisms are effective in tracking the incidence of cancer, there is, at present, very little precise information linking cancer incidence to specific causes. Incidence on environmental exposures of individuals who develop cancer – obtained through work or residual histories – is rarely systematically collected, and then usually only for special studies (1).

The *National Enhanced Cancer Surveillance System*, a national database established to examine environmental links with cancer maintained by Health Canada, includes data collected on 20,000 cancer cases diagnosed from 1991 to 1997, as well as 5000 controls (individuals without cancer) (5). Data were compiled through a questionnaire used to collect information on smoking, diet, physical activity, and reproductive, residential and work histories. Another database, the Environmental Quality Database, was established to collect publicly available information on air and water pollution. These two databases enable researchers to assess the impact of air and water quality in relation to a range of cancer types.

Surveillance of Exposures to Environmental Carcinogens

The surveillance of exposures to environmental carcinogens identifies opportunities for intervention to prevent cancer. This information can be collected through registries or databases tracking individuals or communities and documenting their exposure to environmental carcinogens. At present, the surveillance of exposure to environmental carcinogens in Canada (excluding occupational surveillance mechanisms) is limited to a small number of initiatives.

The *Northern Contaminants Program* monitors contaminants in humans and animals in the far northern regions of Canada, such as organochlorines that build up in the food chain (6). It also includes environmental carcinogens such as cadmium and chlorinated biphenyls (PCBs). The goal of the program is to reduce contaminants in fish and animals so that communities in northern Canada can continue to consume traditional foods indigenous to the region. The Canadian government uses this data to regulate persistent organic pollutants and negotiate restrictions on their use through international agreements.

Alberta is the only Canadian province with a surveillance program that monitors people's exposure to industrial air pollution. This initiative, the *Alberta Community Exposure and Health Effects Assessment Program*, monitors airborne carcinogens such as benzene and arsenic (7). Exposure to these substances is monitored through personal air monitoring equipment, questionnaires, and urine and blood sampling. Through this program, the Alberta government has collected baseline data on environmental pollutants that can aid in the identification of current and future health risks.

Surveillance of Exposures to Environmental Carcinogens in Other Jurisdictions

Compiled by the U.S. Centers for Disease Control and Prevention, the *National Report on Human Exposure to Environmental Chemicals*, provides an ongoing assessment of human exposure to environmental contaminants obtained through biomonitoring (8). Biomonitoring relies on analyses of blood or urine to identify levels of toxic chemicals resulting from environmental exposures. Although the Canadian government has conducted limited biomonitoring, no comparable national program has been implemented in Canada.

Gaps in the Surveillance System

A key gap in current surveillance efforts is the lack of funding for both cancer and carcinogen surveillance. It is estimated that the major funding bodies for cancer research in Canada allocate between 90 to 95 percent of grants monies to treatment research, and only 5 to 10 percent to identifying causes of cancer and the prevention of exposure to carcinogens (1).

Provincial cancer agencies and treatment centres do not routinely record the work and residential history information required to identify environmental exposures of cancer patients. Information on exposure to environmental carcinogens is only done on a piecemeal basis through periodic surveys targeting specific substances.

There are significant gaps in surveillance infrastructure in Canada. Most notably, Canada does not have a national biomonitoring program tracking human exposure to environmental carcinogens.

Right to Know Measures

Information disclosure laws provide the public with the right to access information about environmental carcinogens held by governments and employers. Information disclosure laws, which are often referred to as “right to know” laws, are important for the primary prevention of cancer because the disclosed information makes it possible to identify known or suspected carcinogens in the environment. The intent of right to know measures is to ensure that people and communities who may be at risk are informed. This, in turn, gives them an opportunity to reduce or eliminate their exposures.

Right to Know Laws in Canada

In Canada, the most important statute providing public access to information on environmental contaminants is the *Canadian Environmental Protection Act (CEPA)*, which was passed into law in 1999. This Act established the *National Pollutants Release Inventory (NPRI)*, a national inventory of specific chemicals released in soil, air and water (9).

The NPRI provides information on the release of 268 key pollutants, including many known and suspected environmental carcinogens. As such, it is the only national, legislated and publicly accessible inventory established in Canada. The CEPA requires facilities with more than ten employees to submit an annual report documenting releases of any of the 268 listed substances in quantities exceeding ten tonnes and concentrations exceeding one percent.

The collected information is available in an annual public report and an on-line database. NPRI data is also available through *PollutionWatch*, an online, searchable (by postal code) website maintained by the Canadian Environmental Law Association (10). The NPRI includes information on the company, its location, number of employees and the nature of its activities. In addition, it identifies all of the listed chemicals released to water, air or soil, injected underground, or transferred off-site for disposal or recycling. Companies are also required to state the reasons for changes in yearly releases, information on anticipated changes and any pollution prevention activities they have undertaken.

Environment Canada maintains that the publication of NPRI data motivates companies to reduce their emission of pollutants. It also allows the government to monitor pollution trends, set priorities for action and develop regulatory initiatives (1).

Although provincial legislation requires employers to monitor discharges to outside air and water, this information is not generally made public. One notable exception is information on the testing of environmental toxins in drinking water.

In Ontario, right-to-know legislation on the release of chemicals in drinking water, including known and probable carcinogens, was passed following the deaths of seven people from exposure to contaminated drinking water in Walkerton Ontario in May 2000. *The Ontario Safe Drinking Water Act* and *Drinking Water Quality Standards Regulation* (2002) mandates that the results of water tests for specific substances (required under the legislation) be made available to the public on demand (11). The list of monitored chemicals includes many confirmed and probable carcinogens, such as cadmium, arsenic, benzene and radionuclides.

Under the terms of the Safe Drinking Water Act, water suppliers, primarily municipalities, must prepare an annual report that includes the test results. The supplier is required to post the annual reports on the internet if their water system serves more than 10,000 people.

Right to Know Laws in Other Jurisdictions

In the United States, the predominant information disclosure law is the *Emergency Planning and Community Right to Know Act* (EPCRA). Adopted in the wake of the toxic gas leak at the Union Carbide plant in Bhopal India that killed thousands of people, the Act ensures that firefighters and communities know what high risk materials are stored in facilities near them (12). This legislation was the inspiration for the NPRI in Canada. However, the American version, the *Toxics Release Inventory* (TRI) component of EPCRA, is more comprehensive and allows more access to information. For example, the list of chemicals covered by EPCRA is more comprehensive than the NPRI (650 vs. 268). And, unlike the NPRI, the TRI requires reporting on pesticides.

The TRI has become a powerful advocacy tool for environmental activists in the U.S., such as the Bucket Brigades, who are fighting polluters in their communities (1). An American Environmental Group, Environmental Defence, operates a program called Scorecard, which helps citizens to identify potential health hazards in their communities by plotting TRI data on national maps based on zip codes (13). It also provides information on health hazards related to these chemicals. Environmental Defence estimates that American industries release over 72 million pounds of known carcinogens per year (14).

The United States also has the *Fair Packaging and Labelling Act*, which requires the listing of ingredients, including chemicals, on personal care products and other consumer goods (15). In Canada, the federal Minister of Health recently announced changes to

Canada's Cosmetic Regulations under the *Food and Drugs Act* that will require companies to list ingredients on labels (16). The European Union also requires companies to list ingredients on labels, but does not permit carcinogens in cosmetics (1).

A number of American States provide expanded access to information through right-to-know legislation. In 1983 New Jersey was the first state to pass such legislation with the enactment of its *Worker and Community Right to Know Act* (17). Employers covered by the Act, which is more extensive than the corresponding federal legislation, must complete surveys listing the names and amounts of hazardous chemicals stored and used at their site.

California's *Safe Drinking Water and Toxic Enforcement Act* (aka Proposition 65) is perhaps the most relevant for the primary prevention of cancer. The legislation requires the identification of all chemicals in drinking water and all products available in California through explicit warnings (18). The explicit warning provision of the Act has led many manufacturers to reformulate their products to avoid warning labels.

European countries have utilized a range of right-to-know approaches to discourage the use of carcinogens. Both Denmark and Sweden have compiled publicly available lists of hazardous chemicals (19). These lists achieve the dual objectives of serving as early warning systems about chemicals likely to be targets of future regulation while warning consumers that products containing these chemicals should be avoided.

The practice of 'eco-labelling,' which labels products that are free of hazardous chemicals, is much more prevalent in Europe than it is in North America. Labels such as the Swan, the official Nordic ecolabel, or the flower adopted by the European Union, are used to notify consumers that products have been checked for ecological criteria (20).

Canada, by contrast, has made only limited efforts to inform consumers about environmentally-friendly products. The Environment Choice Program developed by Environment Canada approves products that do not contain any proven or probable carcinogens (based on the IARC list). Unlike the European initiatives, the Environment Choices program does not target consumers; instead, it is used primarily to inform the purchasing decisions of businesses and government agencies that have adopted 'green' procurement policies. The City of Toronto, for example, consults the Environment Choice program to guide the purchase of non-toxic cleaning products (21).

Gaps in Canadian Right-to-Know Measures

While Canada has followed the lead of the U.S. in passing right-to-know legislation on hazardous substances released into the environment, community access to information on chemicals being used or stored in workplaces is extremely limited. For example, the Material Safety Data Sheets indicating chemicals used or stored in Ontario workplaces, which are completed as a requirement of the *Workplace Hazardous Materials Information System* (WHMIS), are not available to the broader community as they are in

the United States under the provisions of the *Emergency Planning and Community Right to Know Act* (1).

The *National Pollutants Release Inventory* (NPRI) provides only a limited amount of data. In its current form, the NPRI only applies to companies releasing large amounts of chemicals. The ten-tonne threshold limit specified in the NPRI enables many industries to avoid reporting limited releases of toxic substances. For example, small industries, such as drycleaners, electroplating facilities and auto-body shops, release known carcinogens that are not subject to NPRI reporting requirements.

Regulatory gaps are also present in Canadian legislation regulating the labeling of consumer products containing hazardous substances. While the *Hazardous Products Act* requires labeling indicating hazards and some ingredient disclosure, it does not require full disclosure of all potentially hazardous ingredients, such as carcinogens. Proposals regarding the adoption of full disclosure requirements for consumer products in Canada are currently under discussion (1). There is no approved ecolabelling program in place for Canadian consumers.

Public Education Initiatives

Public education campaigns around ‘everyday carcinogens’ – carcinogens found in food, automobile exhaust, water, household cleaners and cosmetics – have been carried out by community groups, environmental organizations and groups of cancer survivors across Canada. Often working with minimal financial support and volunteer labour, these groups have been effective in raising public awareness of the links between exposures to environmental carcinogens and possible health impacts, and, in so doing, have helped the general public to reduce their exposures to these substances.

As a general rule, education efforts carried out by these groups are based on the *precautionary principle* – that it is more prudent to avoid activities or substances posing a threat to health than to wait for definitive scientific proof. They also promote the elimination and substitution of carcinogens in consumer products, as well as the reduction or elimination of environmental carcinogens (1).

Canadian Public Education Initiatives

The Labour-Environmental Alliance Society (LEAS), a coalition of labour and environmental groups based in Vancouver, British Columbia, works to reduce cancer risks by educating school children, workers and the general public about products containing carcinogens (22). The *CancerSmart Consumer Guide* published by the Society reviews pesticides, cleaning products and food, describing the hazards and recommending safe alternatives. The Guide documents some of the most toxic substances used in Canadian homes, including carcinogens in household products that should not be used such as trichloroethylene in spot cleaners.

LEAS shares its information at home shows and school presentations. LEAS work in schools includes assisting teachers and students with audits aimed at identifying hazardous products used in and around the schools and substituting them with safe alternatives. Students are encouraged to conduct the same type of audit in their homes.

Another educational resource that provides consumers with the knowledge to reduce their exposures to carcinogens is the “Guide to Less Toxic Products” produced by the Environmental Health Association of Nova Scotia (23). The guide identifies carcinogens in commonly used products and lists recommended alternatives.

Citizens for a Safe Learning Environment (CASLE), a school environmental health group based in Nova Scotia, contributed to the construction of a Halifax high school with minimal use of hazardous substances. As a result of their work on the project, the Nova Scotia government incorporated standards of environmental design and construction into their Design Requirements Manual for the construction of schools and other public buildings (24). CASLE also developed guidelines for cleaning and maintenance products and lists of chemical products to be avoided, such as formaldehyde and toluene. School boards in Nova Scotia have used the guidelines to develop their own purchasing policies for less toxic cleansers.

Extensive outreach and public education on environmental carcinogens has been led by breast cancer survivor groups, many of which maintain that the high incidence of breast cancer is partially attributable to environmental exposures. Groups such as the Women’s Healthy Environments Network, the Saunders-Matthey Breast Cancer Prevention Coalition, and Breast Cancer Action Montreal have all utilized educational materials, internet communications and conferences to raise public awareness about environmental toxins and cancer (25, 26). The Women’s Healthy Environments Network produced a film, *“Exposure: Environmental Links to Breast Cancer”*, that has been nationally televised and screened at many conferences in Canada and around the world. Breast cancer survivor groups also contributed to organizing a 1999 conference on ‘everyday carcinogens’ in Hamilton, Ontario.

Formed in 2000, The Canadian Coalition for Green Health Care focuses on encouraging pollution prevention, energy conservation, solid waste reduction, indoor air quality and environmentally responsible design within the Canadian health care system. (27). The Coalition has worked to eliminate the use of polyvinyl chloride plastics in the health care industry. It has also been effective in raising awareness of dioxin emissions by hospital incinerators and promoting the substitution of non-incinerating waste technologies.

Reach for Unbleached, a Vancouver-based organization, educates people about the potential health risks associated with pulp mill pollutants, including carcinogens such as formaldehyde. They publish fact sheets and a newsletter, and conduct workshops, presentations and outreach in communities where pulp and paper mills are located (28).

Public Education Initiatives in Other Jurisdictions

In both Europe and the United States, environmental organizations have conducted similar education campaigns aimed at raising public awareness on the relationship between environmental carcinogens and cancer. Groups like the U.S. Breast Cancer Fund have mounted high-profile campaigns lobbying for stronger protective legislation in U.S. states including California and Massachusetts. In Europe, groups such as Greenpeace and Friends of the Earth conduct independent monitoring of carcinogens and promote the results of their monitoring studies through public awareness campaigns highlighting the need for stronger regulatory measures (1).

At the same time, these groups have also mobilized the public through consumer campaigns. These campaigns rely on pledge cards as a means of pressuring retailers to rid products of carcinogens and other toxins. These efforts have been instrumental in persuading major European retailers, such as Ikea, the Body Shop, Marks and Spencer and Boots to review the toxicity of chemicals in their product lines (29).

Gaps in Public Education

In spite of the efforts of environmental education groups, there is not a lot of easily accessible information about carcinogens in the environment or widely-used consumer products. At present, there are only a few Canadian groups concerned with the primary prevention of exposure to environmental carcinogens, and there is little government support or funding for these organizations (1).

Reductions of Carcinogens at the Source

A growing number of Canadian companies are making significant reductions in the levels of carcinogens they release in the environment. According to an Environment Canada study, they are motivated by various factors, including liability concerns, compliance with government regulations, pressure from labour and environmental groups, and increased public demand for safer products (30).

Although the study found that government regulation was the most effective means of implementing environmental improvements, federal and provincial governments have tended to favour voluntary pollution prevention, defined by the federal government as “the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste and reduce overall risk to human health and the environment.” (31). Pollution prevention strategies have resulted in concrete, measurable reductions of environmental carcinogens. In the absence of a regulatory framework requiring all companies to meet the same targets, however, source reductions of

environmental carcinogens have proceeded in a piecemeal fashion that benefits some communities while penalizing others (1).

Canadian Source Reduction Initiatives

In 1998, Novopharm, a pharmaceutical manufacturing company in Toronto with approximately 1000 employees, was the largest single emitter of methylene chloride in Canada. As part of the NPRI, Novopharm was required to report these discharges every year (32). Over a five-year period, Novopharm modified their manufacturing process by switching from a solvent to an aqueous-based coating process. As a result, current air emissions of methylene chloride are negligible and workers' exposures in the plant have been eliminated. The average cost savings of switching the coating process is estimated at \$1 million per year.

Interface, the world's largest flooring company, is a leader in the adoption of environmentally friendly manufacturing processes. In Belleville, Ontario, where Interface manufactures nylon carpet tiles, changes in the design printing process eliminated the need for dyes that were the products of heavy metals. All of the carpet tiles currently produced by Interface are non-toxic. Interface no longer uses any toxic or carcinogenic substances that would be released inside the plant or into the water and air outside the plant (33).

Prior to 1992, the Campbell River Gold Mine in Red Lake, Ontario released high levels of arsenic into the air as a result of its roasting process that separated the gold from the ore. The company made an economic decision to modify its processes and replaced the roasting process with an autoclave (a pressure oxidation system similar to a pressure cooker). The conversion to an autoclave process resulted in a 99 percent reduction of arsenic discharges into the air and water. The process also eliminated the potential for arsenic inhalation for employees conducting maintenance work on the roaster (34).

The traditional processing of aluminum is associated with high levels of polycyclic aromatic hydrocarbons (PAHs), a known human carcinogen linked to occupationally-related lung and bladder cancers. In 2001, Alcan in Quebec introduced a new, low-level PAH coal tar pitch that reduced inside PAH levels by 30-70 percent and outside PAH emissions by 35-50 percent. As Alcan phases out its older plants in Quebec over the next decade, it is building new plants incorporating technology that almost completely eliminates PAHs. (35).

Health care facilities have also initiated voluntary measures to reduce emissions of environmental carcinogens at the source. The incineration of medical waste is a major source of air-borne dioxins and furans. In May 2001, the Ottawa Hospital eliminated the need for incineration by investing in alternative technology, a hydroclave system, that is considered to be the best environmental technology for the decontamination and reduction of biomedical waste (36).

Perchloroethylene (tetrachloroethylene) is a probable human carcinogen used across Canada as a solvent to clean clothes. In 2002, the Carriage Trade Centre in Oshawa, Ontario was one of the first large cleaning plants to convert from dry to wet cleaning, a non-toxic alternative to dry cleaning. Although the initial investment in wet-cleaning equipment was expensive, the company was able to realize cost savings through lower water and electricity bills and the elimination of purchasing perchloroethylene (37).

A number of Canadian companies have developed innovative technologies and products with the potential to reduce or eliminate environmental carcinogens. After 70 years of production, the U.S and Canada moved to halt the sale of wood treated with copper, chromium and arsenic (CCA or pressure-treated wood) for home and playground construction after U.S Environmental Protection Agency estimates revealed that children exposed to playsets and decks treated with CCA may have a significantly increased risk of developing cancer (38). A small Quebec-based company, Pluricapital Industries, has purchased technology developed in France that treats wood with heat. This technology avoids the health risks associated with CCA treated wood (39).

The availability of technical assistance is a critical component of reducing or eliminating carcinogens from manufacturing processes. Since 1998, the Eco-Efficiency Centre in Halifax, Nova Scotia has provided technical assistance that has helped small and medium-sized businesses to generate less waste through resource conservation, recycling and good environmental practices (40). A similar program in Quebec, Enviroclub, operates as a partnership between Environment Canada and the private sector. It consists of about fifteen companies in a given region or sector that carry out pollution prevention projects with the help of a specialized consultant. One of the program's goals is the substitution or reduction in the use of toxic substances (41).

Source Reduction Initiatives in Other Jurisdictions

The United States has several laws promoting the reduction of toxic chemicals. Of these, the *Massachusetts Toxic Reduction Act* (1989) is the most effective and well-funded (42). The Act was the first comprehensive pollution control law in the United States. The Act aimed to reduce toxic waste generated in Massachusetts by 50 percent by 1997; this objective was achieved one year later in 1998.

The *Toxic Use Reduction Act* requires firms using more than a certain amount (over 10,000 pounds) of listed chemicals to develop a plan examining how and why these chemicals are used at their facility and evaluate their options for making reductions. The chemicals on the list include many carcinogens such as nickel, formaldehyde and vinyl chloride.

While the Act does not require these plans to be implemented, the preparation of the plans by industry has resulted in many substitutions and process changes. Since the passage of the Act, there has been a 50 percent reduction in the generation of hazardous waste, a 40 percent reduction in the use of toxic chemicals and a 30 percent reduction in emissions. A cost benefit analysis of the Act showed savings of over \$14 million to

companies. Other benefits included lower environmental permitting, improved operation and maintenance and products re-formulated with non-toxic alternatives.

The support to affected industries provided by the affiliated Toxics Use Reduction Institute was an important enabler to companies making changes (43). The Institute worked with industries to identify solutions and design company-specific alternatives. In addition, the Office of Technical Assistance for Toxics Use Reduction provided free confidential consultations for industry.

Since the passage of the *Toxic Use Reduction Act*, New Jersey and Oregon have passed similar statutes aimed at reducing the use of toxic chemicals. However, the scope of this legislation does not match the Massachusetts experience. Oregon's Toxics and Hazardous Waste Reduction Program is designed primarily to assist medium and small businesses (44).

Europe has adopted a strategy for eliminating carcinogens from industrial use and consumer products with the intent of reducing environmental health risks and preventing cancer. Many European laws or directives identify carcinogens as hazardous substances that should be eliminated or substituted in favour of less hazardous substances. For example, Sweden incorporated the substitution principle into its Environmental Code. As a result, Swedish companies including Tetra Pak, H&M, Ikea and Skanska (one of the largest construction companies) have all phased out potentially harmful substances, including known or suspected carcinogens (45). Germany and Norway also have legislation requiring substitution.

Europe has also introduced legislation that holds industry responsible for re-claiming products with potentially harmful substances at the end of their natural life. Complementary legislation also restricts the electrical and electronics industry from using certain toxic chemicals in the manufacturing process. (46).

Gaps in Source Reduction Initiatives

Although there are legislated requirements to reduce specific toxic chemicals, there is no toxics use reduction legislation in Canada, nor are there mandatory pollution prevention planning requirements that apply to all Canadian companies or policies aimed specifically at eliminating or substituting for carcinogens in the workplace, the environment or products (1). There is limited information and limited access to technical assistance programs to help companies make substitutions for particular chemicals or products.

Legislative/Regulatory Measures

Legislation and regulation are important components of a comprehensive strategy to reduce or eliminate environmental carcinogens. Regulatory measures have proven

effective in reducing the production of carcinogens, eliminating their use in products and limiting their dispersal into the environment.

Legislative/Regulatory Measures in Canada

While environmental legislation in Canada does not focus explicitly on cancer prevention, many federal and provincial statutes include provisions for controlling known or suspected carcinogens in the environment. The most important federal statute is the *Canadian Environmental Protection Act* (CEPA), which was passed into law in 1999. Jointly administered by Environment Canada and Health Canada, it is the primary statute controlling the management of toxic chemicals in Canada (47).

Environment Canada and Health Canada are in the process of reviewing the Domestic Substance List, an inventory of 23,000 commercially used chemicals, to determine which substances require more in-depth assessment. As the assessment progresses, a number of chemicals have been identified as “toxic substances”. If they are added to the List of Toxic Substances under the terms of CEPA, then the onus is on the federal government to control them through regulation, pollution prevention or voluntary procedures such as guidelines.

The federal government can require industries to develop pollution plans for specific chemicals assessed as toxic under CEPA. But industries do not have to submit their plans to the federal government or make them public: they are only required to notify the government that they have developed and implemented a pollution prevention plan (48).

To date, the federal government has used CEPA to propose the banning of one carcinogen, nitrosodimethylamine (NDMA) from use and place restrictions on benzidine and hexachlorobenzene (both of which are listed s 2 B, possible carcinogens, by IARC). Other CEPA regulations have imposed some reductions on carcinogens. For example the Benzene in Gasoline regulations, introduced in 1999, have been effective in reducing urban ambient benzene concentrations by almost 47 percent since 1998 (49).

CEPA regulations in tandem with regulations under the *Fisheries Act* have been effective in reducing the release of environmental carcinogens by the pulp and paper industry. *The Pulp and Paper Mill Chlorinated Dioxins and Furans Effluent Regulations*, introduced by the federal government in 1992 under the *Fisheries Act*, set discharge limits and monitoring requirements for dioxins and furans from pulp mill effluents. Under the terms of CEPA, all mills were required to conduct environmental effects monitoring of their effluents.

These regulatory measures prompted most pulp and paper mills in Canada to invest in control equipment and convert from the use of chlorine-to-chlorine dioxide in their processes. Discharges of chlorinated dioxins and furans have been reduced by 99 percent (from 288 grams per year in 1989 to 3 grams per year in 1997). Fish advisories have been

lifted in most areas where levels of dioxins and furans in fish have declined since the regulations came into effect (50).

In Ontario, emissions of carcinogens and other toxic substances into air, soil and groundwater are regulated under the provisions of the *Environmental Protection Act*. In 2005, the Ontario government amended the *General Air Pollution Regulation 346* of the Act by introducing and updating emissions standards for 29 pollutants, including known and suspected carcinogens such as arsenic, cadmium, chromium VI, tetrachloroethylene, trichloroethylene and vinyl chloride (51, 52). The allowable limits for nitrogen oxide and sulphur dioxide emissions were also revised (53).

Since the 1990s, Canadian municipalities have made increasing use of their powers to pass by-laws to control known or suspected environmental carcinogens. In 1990, the community of Hudson, Quebec persuaded their town council to pass a by-law restricting the use of cosmetic pesticides on public and private property. The success of the Hudson by-law, which withstood repeated legal challenges before ultimately being upheld by the Supreme Court of Canada in 2001 (54), inspired communities across Canada to adopt similar regulatory measures. By 2005, at least 66 Canadian municipalities, including Halifax, Toronto, Montreal and Vancouver, have adopted by-laws banning or phasing out the cosmetic use of pesticides (55).

The *City of Toronto Sewer Use* by-law is another example of how environmental carcinogens can be effectively controlled through regulatory measures at the municipal level. Like the *Massachusetts Toxics Use Reduction Act*, the by-law requires certain industries to prepare pollution prevention plans to reduce or eliminate priority pollutants and submit a summary to the City. As such, it is the only by-law in Canada that requires pollution prevention planning (56). The by-law has resulted in significant reductions in carcinogens through substitution by metal finishing companies in Toronto.

Legislative/Regulatory Measures in Other Jurisdictions

In Europe, the Nordic countries have been leaders in their efforts to control environmental carcinogens through regulation. Denmark has passed legislation to ban or phase out arsenic in treated wood as well as lead compounds and metallic lead in products, while Sweden has banned or restricted many of the same substances, as well as cadmium, trichloroethylene and pentachlorophenol. Denmark also reduces exposure to environmental carcinogens through voluntary phase-outs in cooperation with their industries, and has imposed a chemicals tax to discourage the use of hazardous chemicals such as chlorinated solvents (57).

A regulation proposed by the European Union, the *Regulation, Evaluation and Authorization of Chemicals (REACH)* has the potential to be one of the most important regulatory measures to control hazardous chemicals. REACH is designed as a three-stage process: 1) the registration of all new and currently used chemicals with a new agency; 2) the identification of chemicals that are hazardous to human health or the environment through an evaluation process; and 3) regulations stipulating that chemicals posing

certain hazards will only be allowed with the authorization of the European Commission (58).

To obtain a time-limited authorization, industries must demonstrate that they can adequately control the risks of handling the chemical. If they are unable to fulfill this prerequisite, then authorization is still possible if it can be justified by socio-economic factors and there are no possible alternatives. If enacted, REACH will make authorization applications available for public viewing on its website.

REACH is expected to be implemented within the next several years. Given that Europe is the largest producer of chemicals in the world, REACH has the potential to reform the way in which hazardous substances are controlled.

Gaps in Legislative/Regulatory Measures

Perhaps the biggest barrier to the implementation of effective regulatory measures to control environmental carcinogens is the dearth of toxicity data on thousands of chemicals in use. Canada's process for undertaking the review of chemicals under the terms of CEPA may take decades to complete. However, many environmental advocates argue that adoption of the precautionary principle should be the primary consideration guiding the development of regulatory measures controlling the release of chemicals into the environment (59).

At present, Canada has comparatively few legislative bans or restrictions on carcinogenic substances in the environment. Regulations targeting toxic substances under CEPA, including probable carcinogens, often promote pollution control rather than substitution or elimination.

Moving Forward: Opportunities for Action on Environmental Carcinogens

The Toronto Cancer Prevention Coalition, one of the few organizations in Canada focused exclusively on the primary prevention of cancer, identifies the following principles as the basis for action on environmental factors contributing to cancer (59):

- the **precautionary principle**, which states that when an activity poses potential harm to human health and the environment, precautionary measures to reduce options should be adopted even if some 'cause and effect' relationships are not fully established by scientific evidence.
- the **weight of evidence** approach, which considers the cumulative results of different types of research in order to reach a conclusion about the need for action.

- **pollution prevention**, acknowledging that it is less expensive to prevent environmental and human health damage than to manage or treat it after the fact.
- **just transition**, which enables workers and communities to choose economic activity and a healthy environment for themselves, and which suggests that the costs of transition should not be borne disproportionately by affected industries.
- **communities' right to know** about environmental risks and to participate in decisions affecting their health.

These principles are embraced by the effective strategies to reduce or prevent exposures to environmental carcinogens noted in this paper. Drawing on the five principles, the following opportunities for action are suggested as steps towards the development of more effective policies, programs and infrastructures to reduce and eliminate carcinogens in the biophysical environment.

- educate the public and decision makers about the five key principles guiding the reduction and control of environmental carcinogens: the precautionary principle, weight of evidence, pollution prevention, just transition and community right-to-know.
- advocate for the collection of occupational and environmental exposure information by provincial cancer control agencies/programs.
- encourage the development of bio-monitoring programs tracking human exposure to environmental carcinogens.
- advocate for disclosure regulations enabling individuals to access information about chemicals used or stored at workplaces in their communities.
- advocate for amendments to existing consumer products legislation to require full disclosure of all potentially hazardous ingredients.
- increase public education campaigns about 'everyday' carcinogens in the environment and consumer products and the availability of non-hazardous alternatives.
- advocate for the introduction of toxic use reduction legislation in Ontario modeled on the *Massachusetts Toxic Use Reduction Act*
- encourage all levels of government to provide increased supports and incentives for industries to make substitutions for carcinogens, and, where possible, eliminate carcinogens from their production processes.

Conclusion

It is hoped that this document will provide a starting point for an informed discussion of priorities for action and recommendations for addressing gaps in the current infrastructure for the control and reduction of environmental carcinogens in Ontario. While some of the identified gaps and barriers may require an infusion of additional resources, there is much that can be achieved through greater collaboration and the strategic reallocation of existing resources.

It is also hoped that key stakeholders in the field of cancer prevention and the environment will use the document to identify shared objectives for networking, information sharing and advocacy as well as ‘common ground’ for future collaboration and partnership building. Cancer Care Ontario looks forward to engaging in these discussions and collaborating in the development of a comprehensive action plan to more effectively reduce and control exposures to environmental carcinogens in Ontario.

Strategies for the Reduction and Control of Environmental Carcinogens in Canada

Summary of Key Gaps/Barriers

Surveillance

- work and residential history information needed to identify environmental exposures of cancer patients is not recorded
- absence of national bio-monitoring program tracking human exposures to environmental carcinogens

Right to Know Measures

- lack of community access to information on chemicals being used or stored in workplaces
- *National Pollutants Release Inventory* disclosure regulations only cover companies releasing large amounts of toxins
- current consumer product regulations (i.e., *Hazardous Products Act*) do not require full disclosure of all potentially hazardous ingredients

Public Education

- lack of easily accessible information about ‘everyday carcinogens’ in the environment and consumer products

Reductions of Carcinogens at the Source

- no toxics use reduction legislation in Canada
- lack of mandatory pollution prevention requirements or policies aimed specifically at eliminating or substituting for carcinogens
- limited supports and resources to assist companies in making substitutions for environmental carcinogens

Legislative/Regulatory Measures

- emphasis of existing legislation on pollution prevention rather than substitution and the precautionary principle

Opportunities for Action

- educate the public and decision makers about the five key principles guiding the reduction and control of environmental carcinogens: the precautionary principle, weight of evidence, pollution prevention, just transition and community right-to-know.
- advocate for the collection of occupational and environmental exposure information by provincial cancer control agencies/programs.
- encourage the development of bio-monitoring programs tracking human exposure to environmental carcinogens.
- advocate for disclosure regulations enabling individuals to access information about chemicals used or stored at workplaces in their communities.
- advocate for amendments to existing consumer products legislation to require full disclosure of all potentially hazardous ingredients.
- increase public education campaigns about ‘everyday’ carcinogens in the environment and consumer products and the availability of non-hazardous alternatives.
- advocate for the introduction of toxic use reduction legislation in Ontario modeled on the *Massachusetts Toxic Use Reduction Act*
- encourage all levels of government to provide increased supports and incentives for industries to make substitutions for carcinogens, and, where possible, eliminate carcinogens from their production processes.

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Appendix A: List of Key Stakeholders Interviewed for Report

The following individuals were consulted during the preparation of this report. Their input, advice and feedback are gratefully acknowledged.

Dr. Donald Cole, Associate Professor, Department of Public Health Sciences, University of Toronto

Dr. John Ferguson, Education Officer, Environmental Commission of Ontario

Ruth Grier, Cancer Prevention Activist and former Ontario Minister of Health and Long-Term Care

Andy King, National Health, Safety and Environment Coordinator, United Steelworkers of America

Safoura Moazami, Coordinator, Toronto Cancer Prevention Coalition

Katrina Miller, Toronto Environmental Alliance

Sara Miller, Toronto Environmental Law Association

Ken Ogilvie, Executive Director, Pollution Probe

Dr. John Wellner, Ontario Medical Association