

Management of Risk to Human Health Posed by Dioxins Under the Canadian Environmental Protection Act (CEPA)

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RISK ASSESSMENT

- Following a 1990 risk assessment under the Canadian Environmental Protection Act (CEPA) polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans were declared toxic. For further information about CEPA see: <http://laws.justice.gc.ca/en/C-15.31/29268.html>.

- Most exposure of the general Canadian population to dioxins occurs through the diet, with over 95 percent of dioxin intake from animal fats. Small amounts of exposure occur from breathing air that has been contaminated with trace amounts of dioxin, from inadvertent ingestion of soil containing dioxin, and from absorption through the skin.

- Some individuals exposed at higher levels attributable to occupational settings (incineration, pesticide production, aluminum recycling), industrial accidents (Seveso, Italy 1976 release from chemical factory), discrete food contamination incidents (1999 contamination of Belgian animal feed/food products; contamination of fish in certain Canadian waters), or living in proximity to elevated environmental levels (elevated soil levels in vicinity of incinerator in St. Ambroise, Quebec).

- Quantitative estimates of risk undertaken -> comparison of exposure with a tolerable daily intake (TDI).

- Reassessment of the risk to human health posed by these substances in Canada currently being undertaken by Health Canada, based on new information available since the 1990 assessment.

- For Health Canada publication "It's Your Health - Dioxins and Furans" for general public information, see:

<http://www.hc-sc.gc.ca/english/iyh/environment/dioxins.html>.

RISK MANAGEMENT

Objective:

The Canadian federal Toxic Substances Management Policy requires that for substances which:

- are toxic
- persist in the environment
- bioaccumulate
- result predominantly from human activity

the ultimate goal is virtual elimination. Because dioxins and furans satisfy these criteria, the management objective is virtual elimination of measurable releases of these substances into the environment.. Measurable releases are defined as releases above the Level of Quantification (LoQ), which is the lowest concentration that can be accurately measured using sensitive but routine sampling and analytical methods. For dioxins and furans released to air, that level is 32 picograms of toxic equivalents (TEQ) per cubic metre.

Federal Management Initiatives Under CEPA

- the Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations (1992) under CEPA, whereby it became necessary for pulp and paper mills to implement process changes which prevent the formation of dioxins and furans. There are 81 pulp and paper mills Canada.
- the Pulp and Paper Mill Defoamer and Wood Chip Regulations (1992) under CEPA, limiting the maximum concentration of dioxins and furans in defoamers, and prohibiting the sale and import of wood chips made from wood treated with polychlorinated phenols.
- the PCB Waste Export Regulations (1997) under CEPA, which restrict the export for destruction of PCBs, some of which exhibit dioxin-like activity, subject to rigorous environmental controls. These are under amendment to include imports of PCB wastes

Canada-Wide Standards

- a joint federal-provincial program administered by the Canadian Council of Ministers of the Environment (CCME).
- addresses key environmental protection and health risk reduction issues that require common environmental standards across the country for releases of dioxins and furans.

governments determine priorities, develop standards, and prepare complementary workplans to achieve those standards, based on the unique responsibilities and legislation of each government.

- standards developed using a firm scientific foundation and a risk-based approach incorporating socio-economic factors and issues of technical feasibility.

- measures put in place stipulating that sources which produce dioxins, adopt process changes to prevent the release of these substances to the environment, preferably through pollution prevention. Pollution prevention is defined under CEPA as the use of processes, practices, materials, products, substances or energy that avoid or minimize the creation of pollutants and waste and reduce the overall risk to the environment or human health.

- may encompass numeric limits (e.g., ambient, discharge, or product standard), a timetable for attainment; and a framework for monitoring progress and reporting to the public, accompanied by a list of preliminary actions to attain the standard.

- frequently involves the development of technical performance standards for facilities releasing these substances and also other measures including public education, to address consumer activities which may contribute to the environmental loading of dioxins.

- initial efforts focussed on atmospheric releases.

- six priority sectors, varying from regional to national in scope, accounting for about 80% of national emissions identified as major contributors to environmental deposition of dioxins and furans. These are:

Waste incineration - generates 44.9g TEQ/y or 22.5% of national releases to the atmosphere: includes (1) 39 municipal solid waste facilities across Canada releasing 8.4 g TEQ/y; (2) 2 hazardous waste facilities in Alberta, 4 in Ontario, 2 in Quebec releasing total of 7.6g TEQ/y; (3) 6 sewage sludge facilities in Ontario, 2 in Quebec, 2 in Saskatchewan releasing total of 0.1 g TEQ/y; and (4) 122 medical waste facilities across Canada releasing 28.8g TEQ/y.

Coastal pulp and paper boilers - 11 facilities in British Columbia and generating 8.6g TEQ/y or 4.3% of national releases to the atmosphere.

Residential waste combustion - prevalent throughout Canada and estimated to generate 20g TEQ/y or 12% of national releases to the atmosphere.

Iron sintering - 4 facilities in Ontario and generating 6.0g TEQ/y or 4% of national releases to the atmosphere.

Electric arc furnace steel manufacturing - a component of 11 non-integrated steel mills in Canada, 5 in Ontario, 3 in Quebec, 1 each in Alberta, Saskatchewan, and Manitoba, and generating 11g TEQ/y or 7% of national releases to the atmosphere.

Conical municipal waste incinerators - 41 facilities in Newfoundland and Labrador and generating 44.0g TEQ/y or 27% of national releases to the atmosphere.

- remaining sectors (i.e., base metals smelting, diesel fuel combustion, electric power generation) being managed by means of a multi-pollutant approach ensuring that dioxins and furans issues are addressed in accordance with the ultimate goal of virtual elimination.

- related initiatives under the CCME include:

Ambient Environmental Standards

- guidelines (i.e., residential soil guideline of 4ng TEQ/kg) outlining ambient levels to be used by jurisdictions within Canada as benchmarks for the management and monitoring of dioxins and furans already present in the environment.

Guideline development for wood treaters and a national waste management strategy to manage out-of-service treated utility poles.

Air emissions characterization from various sources including steel manufacturers, base metal smelters, kraft boilers and waste incinerators.

Strategy review focussed on reduction of barrel burning and other open burning in Canada, in particular regarding management of waste in remote and northern communities.

- for more information see:
http://www.ccme.ca/initiatives/standards.html?category_id=50

RESULTS

Sources of Exposure

- dioxin and furan releases in Canada declined by more than 60% since 1990.
- releases of dioxin to air in Canada reduced by 61% during the last decade, attributable to the implementation of federal guidelines for incinerators and cement kilns burning hazardous wastes and to voluntary actions on the part of other sectors.
- releases of dioxin to water reduced by 99%, thereby achieving the goal of virtual elimination from the pulp and paper sector.
- current Canadian average dioxin intake from food approximately 5.6 pg/kg bw/week, compared to European Union estimated of 8.4-21.0 pg/kg BW/week.
- levels of dioxins in most Canadian foods are lower than proposed European Union limits.

Human Tissues

- levels of dioxin in Canadian serum and breast milk declined by 50% from the 1980s to the 1990s.
- pooled Canadian breast milk samples indicated dioxin levels of 40.7 pg TEQ/g lipid in 1981 vs. 19.9 pg TEQ/g lipid in 1992.
- Canadian human tissue levels approximately 2-fold lower than those of most European countries.