

Study links dioxin pollution in Arctic to North American sources

New York and Montreal, 10/3/2000-A study conducted for the North American Commission for Environmental Cooperation (NACEC) has, for the first time, linked dioxin pollution in Canada's Arctic to specific sources in Canada, Mexico and the United States.

Using a sophisticated air transport model developed by the US National Oceanographic and Atmospheric Administration (NOAA), a research team headed by renowned scientist Dr. Barry Commoner, of Queens College, New York, identified facilities in the south causing dioxin pollution at eight locations in Nunavut, the Canadian territory covering the eastern Arctic north of the 60th parallel to the pole. US waste incinerators (municipal and medical), together with cement kilns burning hazardous waste as fuel and metal processing facilities were the main sources of dioxin reaching the far North, the research found. The report is based on data from a 1996-97 inventory of sources, some of which may have reduced or eliminated dioxin emissions since.

It is the first-ever continent-wide study of dioxin that traces source-to-receptor relationships.

NACEC is a Montreal-based organization established under the environmental side accord to the North American Free Trade Agreement. The research was done by the Center for the Biology of Natural Systems, Queens College, City University of New York. In addition to Dr. Commoner, the research team included Paul Woods Bartlett, Holger Eisl and Kimberly Couchot.

Dioxins are a public health and environmental concern because some types have known carcinogenic and toxic properties that can produce a range of health problems. These include adverse effects upon reproduction and development, suppression of the immune system, chloracne (a severe acne-like disease that sometimes persists for many years), and cancer.

Dioxins are produced by a number of chemical processes, including some metal refining methods, the chlorinated bleaching of pulp and paper, and, most importantly, as a byproduct of the combustion of certain materials.

Combining North American pollution data with meteorological records and other information, the study identifies the main sources of dioxin pollution at each of eight Nunavut areas over the period 1 July 1996 to 30 June 1997, the most recent year for which comparable Canadian and US data were available. Mexican data were derived through the preparation of a first dioxin emissions inventory for that country.

Nunavut provides an ideal test ground for the study of long-range transport of the pollutant because there are no significant sources of dioxin in the territory nor within 500 km (300 miles) of its boundaries. The contribution of Nunavut sources to the dioxin in the territory was estimated at 0.2 percent.

US facilities were found to have contributed between 70 and 82 percent of dioxin deposited at the eight locations in Nunavut. Canadian facilities contributed 11 to 25 percent (depending on the northern location in question), while Mexican emissions, largely caused by backyard trash burning, contributed 5 to 11 percent.

The relatively small contribution of Mexican sources to dioxin deposition in Nunavut compared to their larger share of the total North American dioxin emission inventory (30 percent) is in part a reflection of their greater distances from the receptor areas compared to US and Canadian sources.

An estimated 2 to 20 percent of dioxin pollution in Nunavut areas originates outside North America—chiefly in Japan, France, Belgium and the U.K., the study says.

It is clear that what we do anywhere on this continent can have serious effects somewhere else, even very far away, and the study shows us these connections, says NACEC Executive Director Janine Ferretti. This model provides us with a tool that can help us tackle the problem at source and provides communities across North America with a means of identifying the origins of all kinds of pollutants-not just dioxins-entering their environments.

Our results show that the exposure of Nunavut to airborne dioxin is almost entirely due to sources in the rest of North America, says Dr. Commoner. Sharply reducing or eliminating dioxin emissions from less than one

percent of these 44,000 sources could appreciably reduce this serious health hazard.

Some remedial measures already in place

Since the period covered in this study, a number of the major sources and source types have come under new requirements to reduce their dioxin emissions.

In the United States, the US EPA has promulgated regulations that should reduce dioxin emissions by 99 percent from municipal waste incinerators and by about 95 percent from medical waste incinerators. The US EPA has also promulgated regulations to reduce dioxin from some hazardous waste incinerators, including cement kilns.

In Canada, environment ministers in June 2000 accepted a Canada-wide Standard for Dioxins and Furans that may be endorsed at the next meeting of the federal and provincial environment ministers in November 2000. Six sectors, including waste incineration, burning salt-laden wood, residential wood combustion, and electric arc furnace steel manufacturing, have been identified for early action. The municipal waste incinerator in Quebec has undergone modifications to virtually eliminate its dioxin emissions.

Few sources cause a large proportion of pollution

Among the study's main findings: relatively few types of sources and individual facilities are responsible for the majority of dioxin deposited in Nunavut, which makes remedial action more manageable.

For example, 35 percent of the dioxin present at one Arctic location, Coral Harbour, is attributed to only 19 sources in the south.

The study shows the amount of dioxin deposited in Nunavut was a function of several factors such as weather, distance, and the rate of emission from a facility.

As well, dioxin deposition varied over the year, with high deposition occurring when the weather patterns favored efficient transport from areas in North America with high emissions. For example, in one Arctic community, Ikaluktutiak, over half of the annual dioxin burden from June 1996 to July 1997 was deposited in two months, September and October.

Top dioxin source categories in North America

While governments have made efforts to reduce dioxin emissions from some of the largest source types, the study shows other major sources of deposition in Nunavut that are not currently subject to controls. These include certain metal processing facilities as well as facilities burning less than 250 tons per day of municipal solid waste.

Of the 23 categories of dioxin sources throughout North America, the biggest are:

- municipal waste incinerators (25 percent),
- backyard trash burning (22 percent),
- cement kilns burning hazardous waste (18 percent),
- medical waste incinerators (11 percent),
- secondary copper smelters (8 percent), and
- iron sintering plants (7 percent).

Together, these six categories contributed more than 90 percent of total North American emissions in 1996-97.

Of the 44,091 individual sources of dioxin on the continent, 22,439 (51 percent) were found to be in the US, 16,729 (38 percent) were in Canada and 4,923 (11 percent) were in Mexico. When ranked according to the amount of dioxin emitted, the United States accounted for 62 percent, Canada 8 percent and Mexico 30

percent.

Creation of Mexico's first draft dioxin inventory

Among several firsts associated with the study was the preparation of a draft inventory of Mexico's dioxin pollution, prepared in cooperation with the Mexican Environment Ministry (*Instituto Nacional de Ecología*). The study estimates that Mexicans recycle six percent of 31 million metric tonnes of municipal solid waste generated annually. Of the remaining 29 million tonnes, roughly half is sent to landfills and half is burned in community dumps and backyard fires, producing dioxin.

Mexico's dioxin inventory, combined with US EPA and Environment Canada data on sources in those countries, allowed researchers to create an unprecedented, comprehensive North American overview of dioxin pollution.

Dioxin and human health

Dioxins are widely distributed in the environment at low concentrations and are not easily broken down by natural processes. As a result, most people have detectable dioxin levels in their tissues that have bioaccumulated over their lifetime, generally through dietary intake.

Human exposure to dioxin is almost entirely (95 percent) through consumption of animal fats. In temperate climates, dioxin enters the food chain through animal food crops and appears in milk and beef. In the Arctic, dioxin enters the food chain through lichen, mosses and shrubs eaten by caribou, and through algae eaten by fish on which seals and walrus feed. The traditional indigenous diet in Nunavut includes caribou, fish and marine mammals.

Earlier studies have found that dioxin concentrations in Inuit mothers' milk are twice the levels observed in southern Quebec.

The report does not analyze the health effects of dioxin on the people in the Arctic. However, the US EPA has recently published a major draft report on dioxin, which found it has the potential to produce a broad spectrum of adverse effects.

Dioxins can alter the fundamental growth and development of cells, which can lead to:

- adverse effects on reproduction and development,
- suppression of the immune system,
- chloracne (a severe acne-like condition), and
- cancer.

Because of their rapid growth and development, fetuses, infants and children may be more sensitive to dioxin exposure than other groups.

The EPA's draft dioxin reassessment has revised the cancer risk from dioxin from earlier reports. The increased lifetime risk of cancer of the general US population from exposure to dioxin could be in the range from 1 in 1000 to 1 in 100, in comparison with the acceptable level of 1 in a million generally adopted by US EPA.

Body burdens of dioxin in the US general population appear to be declining from the late 1980s.

The North American Commission for Environmental Cooperation

NACEC was established to build cooperation among the NAFTA partners-Canada, Mexico and the United States-in protecting their shared environments, with a particular focus on the opportunities and challenges presented by continent-wide free trade.

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