

# International Joint Commission Twelfth Biennial Report on Great Lakes Water Quality

## CHEMICAL INTEGRITY: THE EXAMPLE OF MERCURY

September 2004

### Overview

In the **Great Lakes Water Quality Agreement**, the governments of the United States and Canada agreed “to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.” Under the terms of the Agreement, the two federal governments agreed “to make a maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System.”

The **International Joint Commission (IJC)** is directed to make a full assessment of the progress toward achieving the objectives of the Agreement every two years. The **Twelfth Biennial Report on Great Lakes Water Quality** is the Commission’s most recent assessment of progress.

### The Twelfth Biennial Report on Great Lakes Water Quality

In September 2004, the International Joint Commission released its *Twelfth Biennial Report on Great Lakes Water Quality*. The purpose of the report is to assess the progress being made under the Agreement and highlighting issues we conclude need timely and focused attention.

The Commission does not report on all subjects of importance to the Great Lakes, but analyzes and makes eight specific recommendations regarding the Agreement’s goals of physical, biological and chemical

integrity leading to an ecosystem approach to ecological integrity.

**This information sheet is one of six that highlight important issues discussed in the report.**

### THE EXAMPLE OF MERCURY

The chemical integrity of the Great Lakes is dynamic. The waters of the Great Lakes are continuously changing through the addition, interaction, and loss of both natural and man-made substances. Considerable uncertainty remains concerning the chemical integrity of the Great Lakes and the impacts of various chemicals, and combinations of chemicals, on the basin's human and other inhabitants.

The *Twelfth Biennial Report* focuses on atmospheric sources. Mercury is released into the air by human activities such as metallurgical processing, municipal and medical waste incineration, and electrical power generation such as coal combustion. It is also released to the atmosphere by various natural phenomena, including volcanic eruptions, forest fires, and the weathering of geological formations.

### Mercury and Human Health

Studies reviewed by the U.S. National Academy of Sciences associate chronic low-dose prenatal methyl mercury exposure with poor performance by children on neurobehavioral tests that measure such things as attention, language ability, fine motor skills, and intelligence. Further research is

required to investigate methyl mercury exposure and coronary disease. The majority of epidemiological studies performed has been retrospective, in which linkages are inferred from past events; prospective studies are needed that make a hypothesis and then follow events to observe actual linkages.

### Mercury and Fish Consumption

Eating fish offers many nutritional benefits, including protein and omega-3 polyunsaturated fatty acids. However, caution must be taken to avoid eating too much fish containing excessive levels of methyl mercury or other persistent toxic substances. The primary human exposure to methyl mercury is through fish consumption.

The Commission previously recommended in its 2000 *Tenth Biennial Report* that the governments improve fish consumption advisories in the Great Lakes. The Commission's concerns remain relevant today. Advisories are often technical, sometimes offer conflicting advice, and typically fail to reach at-risk populations, including children and women of child-bearing age.

### Complications of Chemical Mixtures

Fish advisories often mention concerns with mercury and PCBs for the same species in the same water bodies. PCBs affect the thyroid, which controls brain development. Mercury binds to brain tissue and may cause other problems. Both PCBs and mercury can pass through the placenta. Therefore, their combination may pose a greater risk to a developing fetus than either

alone. Current epidemiological studies are exploring this linkage, and further study is warranted.

### **Reductions in Mercury Emissions**

The U.S. Environmental Protection Agency cites rough estimates showing that 20% of global mercury emissions are from natural emissions, 40% from global recycling of previous anthropogenic activity, and 40% from current anthropogenic emissions. North America contributed approximately 11% of the total global anthropogenic mercury emissions in 1995.

### **Conclusions**

Mercury provides a case study for chemical integrity. Much is known about mercury's toxic effects, at higher doses, and there is a growing body of knowledge concerning effects at lower doses. At sufficient levels of accumulation of methyl mercury compounds, toxic effects occur, including neurotoxicity (brain and nerve tissue damage) and nephrotoxicity (kidney damage). The Commission recognizes that both governments are currently considering proposals for further reductions in mercury emissions. The Commission encourages both governments to adopt and implement initiatives that will further reduce the release of mercury to the environment, including atmospheric emissions.

The effects of past mercury emissions, compounded by continuing emissions, will remain an issue for decades to come. Associated risks must be effectively communicated. While both governments have compiled and disseminated fish advisories, difficulties remain in reaching those most at risk and in effecting changes in behavior that would reduce that risk.

Significant gaps in knowledge remain about the processes by which mercury moves from source to water

body, to fish and wildlife, to humans, and about the effects of low doses of mercury on human health. Scientists continue to explore plausible connections and build on the knowledge base. In addition to general studies of this nature, specific focused studies on mercury deposition and its effects on the Great Lakes are required.

### **Recommendations**

The Commission recommends the following to the two federal governments, in conjunction with the states and provinces and institutions.

- Undertake retrospective and prospective epidemiological studies, in Areas of Concern and other pertinent locations of the Great Lakes basin, to better understand potential neuro-developmental effects associated with methyl mercury and PCBs.
- Make fish advisories clear, simple, and consistent, and ensure that they are reaching the intended audiences.
- Select and promptly implement programs in both the United States and Canada that would substantially reduce the deposition of mercury in its reactive gaseous form in the Great Lakes region; also pursue multi-lateral strategies for further control of this persistent toxic substance on a global basis.

### **Scheduled Review of the Great Lakes Water Quality Agreement**

This report triggers the much anticipated review of the historic Great Lakes Water Quality Agreement. The current Agreement was signed in 1978 and was amended in 1987. It has not been updated or changed in more than 17 years. During this time, technology and our scientific knowledge and understanding have grown immensely. We need to keep pace with what we know and review the

Agreement with an eye toward the future.

### **The International Joint Commission (IJC)**

IJC was established through the 1909 Boundary Waters Treaty of the United States and Canada. The Treaty recognizes that each country may be affected by the others' actions in the lake and river systems along their common border; its purpose is to prevent and resolve disputes concerning these boundary waters.

### **For More Information**

Additional information regarding IJC's *Twelfth Biennial Report on Great Lakes Water Quality* can be obtained by contacting an IJC office:

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