

Reducing the Impact of Pharmaceuticals in the Great Lakes

What Are Pharmaceuticals – And What Do They Have To Do With The Great Lakes?

Pharmaceuticals are drugs, such as antibiotics, used to treat disease and improve the quality of life for humans and animals. They have many benefits, which include lowering blood pressure, curing infection and relieving pain. They are not without risks, however, including improper disposal of waste pharmaceuticals, as well as pharmaceuticals that pass through our bodies and those of farm animals and subsequently end up in the Great Lakes. There is a growing concern about the adverse impacts these pharmaceuticals may have on aquatic life, and potentially on human health.

PHARMACEUTICALS IN GREAT LAKES WATER, SEDIMENT AND BIOTA HAVE BECOME AN EMERGING ISSUE OVER THE PAST DECADE BECAUSE OF CONCERNS RELATED TO ADVERSE IMPACTS ON AQUATIC ECOSYSTEMS AND POTENTIALLY ON HUMAN HEALTH.





Presence In The Great Lakes

Pharmaceuticals have been measured throughout the Great Lakes, in the water, in sediments and in living organisms, such as fish. The main types of pharmaceuticals found include pain killers, antibiotics, psychiatric drugs and hormone disrupting compounds. Higher mortality rates and alterations to fish reproductive biology have been observed in some areas, although pharmaceuticals are usually found at low concentrations. The main exposure pathways for humans include drinking water and eating contaminated fish. Research to date has not found risks to human health, but antimicrobial resistance has been found in some parts of the Great Lakes, leading to concerns that harmful bacteria will develop resistance to antibiotics and thus make the treatment of infections in humans and animals more difficult.



FACTS ABOUT THE GREAT LAKES

THEY CONTAIN

20%

OF THE WORLD'S FRESH SURFACE WATER SUPPLY

THEY PROVIDE DRINKING WATER TO OVER

40 MILLION

PEOPLE IN NORTH AMERICA

THEY SUPPORT OVER

3,500

PLANT AND ANIMAL SPECIES

THE ECONOMIC OUTPUT OF THE GREAT LAKES REGION IS ESTIMATED AT

\$6 TRILLION

WHICH WOULD MAKE THE REGION THE THIRD BIGGEST ECONOMY IN THE WORLD IF IT WERE A COUNTRY.

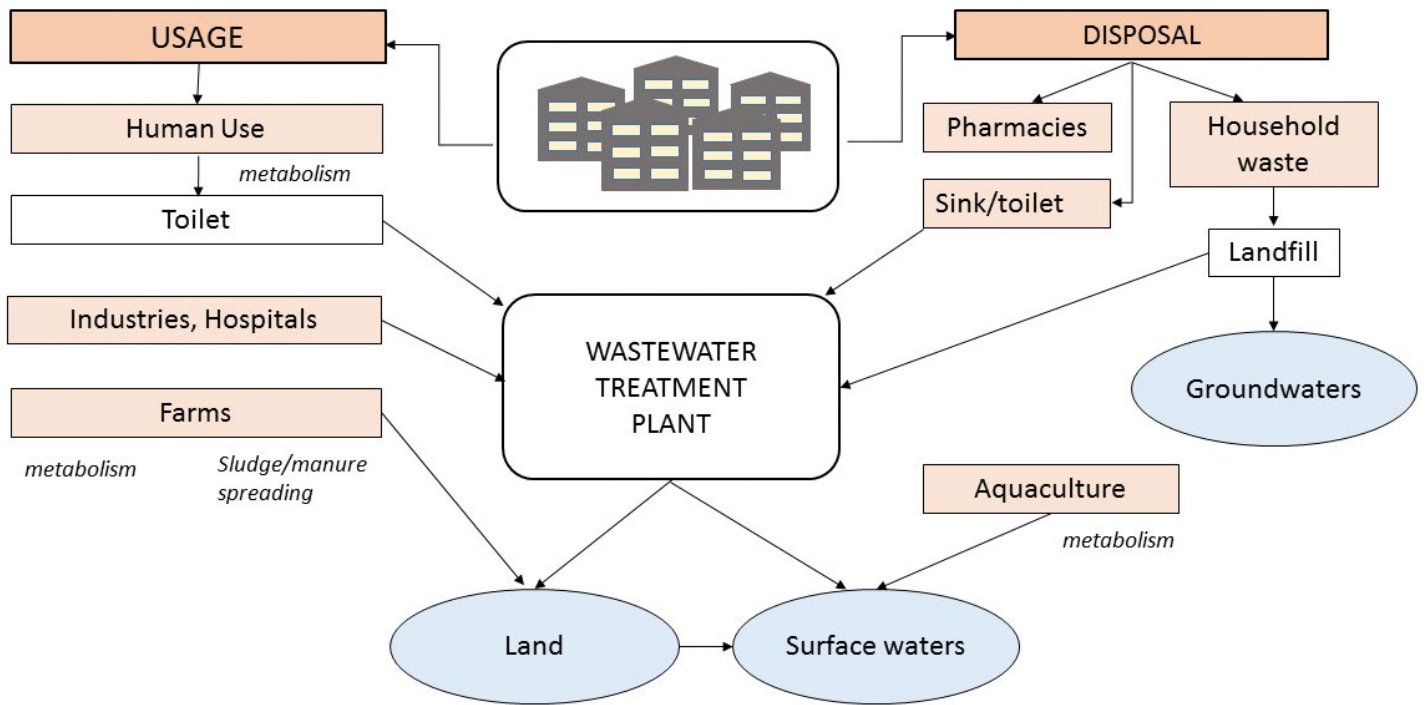


Sources And Levels In The Great Lakes

Sources of pharmaceuticals include municipal wastewater treatment plants (which receive pharmaceuticals from homes, hospitals and healthcare facilities) as well as pharmaceuticals that leak from landfill sites. Agricultural operations and aquaculture (i.e. fish farms) also release pharmaceuticals directly to the lakes or to rivers and streams that flow into the lakes, as do pharmaceutical manufacturers that do not discharge their wastes into municipal wastewater treatment plants.

The highest levels of pharmaceuticals in the lakes are usually found close to municipal wastewater treatment plants and near densely populated urban areas. They have also been measured at relatively high concentrations near intensive agricultural operations.

THE MAIN PATHWAY FOR PHARMACEUTICALS ENTERING THE GREAT LAKES IS FROM MUNICIPAL WASTEWATER TREATMENT PLANTS. OTHER PATHWAYS, SUCH AS RUN-OFF FROM AGRICULTURAL SOURCES ARE SECONDARY. AGRICULTURE IS A MAJOR USER OF ANTIMICROBIALS AND COULD BE AN IMPORTANT SOURCE OF THESE COMPOUNDS IN THE LAKES.



How Pharmaceuticals End Up In The Lakes.¹

Protecting People And The Aquatic Environment

The best protection is to prevent pharmaceuticals from getting into the lakes. Take-back programs at pharmacies along with related initiatives are the first line of defence. Wastewater treatment plants around the Great Lakes remove some but not all of the pharmaceuticals entering them. Pre-treatment at pharmaceutical manufacturers and at heavy use facilities such as hospitals can help to lower concentrations in the lakes. Unfortunately, these measures have limits to their effectiveness, and additional controls are required.



¹ Adapted from Nikolaou, A., Meric S., and Fatta, D. (2007). Occurrence Patterns of Pharmaceuticals in Water and Wastewater Environments. *Analytical and Bioanalytical Chemistry*. 387:1225–1234. <https://www.ncbi.nlm.nih.gov/pubmed/17205270>



The Ozone generator²

Progress In Other Countries

The United States and countries in the European Union have conducted more research on pharmaceutical pollution and have implemented better-coordinated monitoring and control efforts than Canada and Ontario. These other jurisdictions have deployed advanced and alternative wastewater treatment technologies, such as ozonation, that are sparingly used in Ontario, but which would reduce pharmaceutical concentrations in the lakes.

² Source: Jasim, S. Y. (2002). Successful use of ozone for drinking water treatment in Windsor, Ontario. *Environmental Science & Engineering*. <https://esemag.com/archive/0302/ozone.html>

What We Can Do To Reduce Pharmaceutical Pollution

1. Avoid the overuse of medications.
2. Finish using prescriptions as directed by your physician.
3. Take unwanted and waste medications to your local pharmacy for disposal.
4. Take old or unwanted livestock medications to a collection site operated through Cleanfarms Obsolete Pesticide & Livestock Medication Collection Program.
5. Share your concerns with Pollution Probe and we will inform the appropriate government officials and decision-makers.

How You Can Find Out More



For more information on pharmaceuticals in the Great Lakes and the proper disposal of unwanted and waste pharmaceuticals, check out the following resources:

- **Cleanfarms. Obsolete Pesticide & Livestock Medication Collection Program:**

<https://cleanfarms.ca/materials/unwanted-pesticides-animal-meds/>

- **Health Product Stewardship Association. Return locations for unused and expired medications:**

<http://www.healthsteward.ca/>

- **I Don't Flush. A Prescription for Clean Water:**

<http://idontflush.ca/pharmaceuticals/>

- **Pollution Probe. Pharmaceuticals in the Great Lakes:**

www.pollutionprobe.org/pharmaceuticals-great-lakes



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