

# Pharmaceuticals in the Environment - An Emerging Threat?

24,000 drugs are approved for human and veterinary use in Canada - some of these are being found in wastewater, agricultural runoff and drinking water.

Pharmaceuticals such as antibiotics, anti-inflammatories, analgesics and birth-control pills are used by millions of people and play an important role in modern health care. Judicious use of pharmaceuticals in agriculture helps production and advances economic competitiveness. However, recent studies in Europe and the United States, and now in Canada, have alerted us to the fact that these beneficial substances are entering the environment - with as yet unknown consequences.

The technology to test for trace amounts of drugs in water - at the part per trillion level, equivalent to one cent in 10 billion dollars - has only recently become available, and researchers have found pharmaceuticals, and personal care products like cosmetics and fragrances, in municipal sewage, agricultural and aquaculture wastes, and even in drinking water.

Recent media coverage of this emerging environmental problem has raised public concern but as yet there are no definite answers about risks to environmental and human health.

More research on a national and international scale is needed to determine the long-term ecological and human health consequences of continuous low-level exposure to these substances and to "mixtures" of these substances.

## NWRI and Pharmaceuticals in the Environment

NWRI researchers are working with government departments, universities and international colleagues to develop and validate methods to measure pharmaceuticals in the environment and provide the scientific information needed to assess their risks.

In the Great Lakes basin, scientists are carrying out large-scale sampling of sewage treatment plants and receiving waters to determine whether certain human and veterinary pharmaceuticals and cosmetic compounds are discharged to the aquatic environment in concentrations that may pose a risk to aquatic life.

In the Prairies, NWRI is investigating the persistence of two antibiotics - spectinomycin and lincomycin - in liquid hog manure and in soil injected with liquid hog manure as a plant nutrient source. Researchers are assessing the potential for these antibiotics to be transported in surface runoff from cropland to groundwater.

A Trent University/NWRI study of pharmaceuticals in sewage treatment plant effluents of 14 Canadian cities was published in 2003, and NWRI and Health Canada have completed a survey of 20 southern Ontario drinking water facilities (water sources from lakes, rivers and groundwater) for nine acidic pharmaceuticals.

The results of these investigations confirm that some chemicals from pharmaceuticals and personal care products are present in wastewater effluent and in water supply sources, but it remains unclear whether these concentrations pose any risk to ecological (or human) health.



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# Impacts of NWRI Research on Decision Making

**Pharmaceuticals and personal care products entering our water resources is an emerging environmental problem, so the decision-making process that results in protective measures is in its early stages.**

**The scientific information produced by NWRI research on the effects of such substances on aquatic ecosystems will feed into the process, and is already playing a supporting role in informing decisions to regulate and manage them.**

**One aim is to incorporate environmental considerations and safeguards into the pharmaceutical approval procedure, so that society can capitalize on the benefits provided by pharmaceuticals without compromising environmental health. Another is to improve the efficiency of our municipal wastewater treatment systems to remove these substances.**

## Benefits to Canadians

**Although the research to support solutions to this problem is still in its early stages, it will ultimately bring environmental and economic benefits such as:**

- **improved public confidence in the quality of drinking water, as the precise levels in Canadian water supplies become clear and effective measures are put in place to reduce them if necessary;**
- **protection against adverse impacts on Canadian aquatic ecosystems and aquatic life, once sustained research has "teased out" which substance or mixture of substances is causing which effect and environmental management actions are targeted to particular offenders;**
- **continued public access to current and new pharmaceuticals, a necessity of modern health care, through an approval process that builds in environmental protection measures;**
- **development of new, potentially marketable technologies in the wastewater treatment industry to remove or reduce pharmaceutical and personal care substances; and**
- **environmentally sustainable and prospering pharmaceutical, cosmetics, and agri-food industries that benefit consumers without endangering Canadian water resources, as research results are communicated and applied to producing solutions.**