



# Lindane

**Lindane is a persistent organic pollutant (POP) that, as of March 2002, remains registered as an insecticide in Canada, Mexico, and the United States.**

It is one of the most abundant and pervasive organochlorine insecticide contaminants in the environment, especially in the Arctic. In June 2002, the environment ministers from all three countries resolved to develop a North American Regional Action Plan (NARAP) for lindane through the Commission for Environmental Cooperation (CEC) of North America.

## What is lindane?

Hexachlorocyclohexane (HCH) is a synthetic chemical that exists in eight chemical forms called isomers. The different isomers are named according to the position of the hydrogen atoms in the structure of the chemical. Lindane is the 99.5% gamma isomer of HCH, or gamma-HCH which is the only pesticidally active isomer of HCH.

Lindane is registered for use in North America in the agricultural sector for the pre-plant treatment to protect the seeds of certain grain and vegetable crops (e.g., barley, corn, wheat, and other small grains) against insect pests. Products containing lindane are approved for use in the veterinary and public health sectors for treatment of external parasites such as head lice and scabies.

Like other organochlorines, the most widespread exposure to lindane for the general public is through food. There is an important relationship between meat and fish consumption and lindane concentrations in human milk and body fat.

## International activities

Lindane is listed as a persistent organic pollutant (POPs) under the United Nations' Economic Commission for Europe Convention on Long-range Transboundary Air Pollution (LRTAP POPs Protocol) and the Great Lakes Binational Toxics Strategy between the United States and Canada. Lindane is also the subject of a joint reevaluation in the US and Canada under NAFTA's Technical Working Group on Pesticides. So far, the US-Canada review process has resulted in the voluntary cancellation of most uses (e.g., treatment of lumber/timber, soil treatment, and above-ground agricultural use). Canada intends to phase out the remaining use of lindane seed treatments by 2004. In the US, the final reregistration decision was scheduled for July 2002.



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Indigenous peoples who rely heavily on animal fats and protein in their traditional diets are particularly at risk from the effects of lindane and other POPs.



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## The future of lindane in North America

Lindane is an excellent candidate for the development of a NARAP. Lindane is:

1. currently registered for use in all three countries;
2. subject to long-range atmospheric transport to remote regions of North America;
3. believed to cross national boundaries in North America;
4. detected in foods and other agricultural products that are traded between the three countries;
5. a chemical whose management would benefit from shared information exchange and experience with lindane;
6. a chemical whose management would benefit from current/ongoing lindane-reduction initiatives that can be pooled for joint consideration and action.

Lindane was nominated for a North American Regional Action Plan (NARAP) by the United States on 15 January 1999. The substance selection process was documented by a nomination dossier and a decision document that evaluates and summarizes the potential environment and health risks of lindane. In addition, public comments were solicited prior to the preparation of the final decision document that recommended the NARAP. The thorough review undertaken through the substance selection process demonstrated that all criteria meriting regional action were met, and that there was a need to address the risks from lindane on a regional, North American basis.

On a national basis, the potential risks from lindane have resulted in intense review and significant risk reduction measures in both Canada and the US. By sharing the latest scientific data with Mexico and by working on a regional level, we will assure that all governments will have evidence-based information on which to make regulatory decisions. A NARAP for lindane will help to characterize the regional risks posed by the pesticide, facilitate the exchange of information on alternative practices and pest control products, and consider actions to address local public health uses. Again, our three countries and the CEC have an opportunity to take significant steps in reducing risks from a persistent toxic substance and to provide a leadership role in helping other countries address the risks from lindane.

In addition, the NARAP is expected to:

- promote the development of a unified North American position on lindane;
- provide a mechanism for reducing or eliminating non-essential uses in each of the three countries;
- encourage sound management practices and Integrated Pest Management approaches within each country by sharing information;
- evaluate and reduce risk to environmental and human health on a trinational scale;
- allow for further capacity building initiatives between regulatory agencies between the United States, Canada, and Mexico, and strengthen existing working relationships;
- build on the experiences and lessons learned in the development of other NARAPs, specifically those on chlordane and DDT, as this would be the first NARAP developed for a POP actively used in all three countries; and
- assist in the development of a trinational inventory of current uses and quantities imported and annually used in each country. This information will be pertinent to the development of other initiatives, in particular, the NARAP on environmental monitoring and assessment.

## Effects of lindane

Like other POPs, lindane can be transported over long distances through the atmosphere. It vaporizes and condenses, touching down on oceans and freshwater bodies, where it begins the cycle again. This is known as the "grasshopper effect." POPs tend to accumulate in colder climates such as the Arctic, where they are trapped by low evaporation rates.

Lindane is metabolized fairly rapidly in standard test species (e.g., rainbow trout, rats) under laboratory conditions. In humans, the half-life of lindane is approximately one day. However, data from some arctic mammals, birds and fish indicate that under conditions of long-term exposure, the bioaccumulation of lindane can be greater than its metabolism. Although there is evidence that lindane has the tendency to bioaccumulate in arctic animals, in contrast with other POPs, there is no clear evidence of biomagnification in the food chain. Indigenous peoples who rely heavily on animal fats and protein in their traditional diets are particularly at risk from the effects of lindane and other POPs.

A wide variety of toxicological effects are recorded for lindane, such as reproductive and endocrine impairments. Effects from acute exposure to lindane may range from mild skin irritation to dizziness, headaches, diarrhea, nausea, vomiting, and even convulsions and death. Toxicological data indicate that chronic/long-term/lifetime exposure to lindane at high concentrations can adversely affect the liver and nervous system of animals, and may cause cancer and possibly immuno-suppression.

Further information can be found at: [http://www.cec.org/programs\\_projects/pollutants\\_health/smoc/](http://www.cec.org/programs_projects/pollutants_health/smoc/)



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