



Distr.: General
24 August 2005

Original: English



**United Nations
Environment
Programme**

**Stockholm Convention on Persistent Organic Pollutants
Persistent Organic Pollutants Review Committee
First meeting
Geneva, 7–11 November 2005
Item 5 (d) of the provisional agenda***

**Consideration of chemicals proposed for inclusion
in Annexes A, B and C of the Convention: Lindane**

Lindane proposal**

Note by the Secretariat

1. The annex to the present note provides a summary prepared by the Secretariat, as requested by the Chair of the Committee, Mr. Reiner Arndt (Germany), of the proposal submitted by the Government of Mexico for listing Lindane in Annex A of the Stockholm Convention on Persistent Organic Pollutants pursuant to paragraph 1 of Article 8 of the Convention. The complete submission is given in document UNEP/POPS/POPRC.1/INF/8.

Possible action by the Committee

2. The Committee may wish to:
- (a) Consider the information provided in the present document and in document UNEP/POPS/POPRC.1/INF/8;
 - (b) Decide whether it is satisfied that the proposal fulfils the requirements of Article 8 and Annex D of the Convention;
 - (c) Develop and agree on, if it decides that the proposal fulfils the requirements referred to in subparagraph (b) above, a work plan to prepare a draft risk profile pursuant to paragraph 6 of Article 8. In developing such a work plan, the Committee may wish to take into consideration the information given in document UNEP/POPS/POPRC.1/INF/11.

* UNEP/POPS/POPRC.1/1.

** Stockholm Convention, Article 8.

Annex

Proposal for listing Lindane in Annex A of the Stockholm Convention on Persistent Organic Pollutants

Introduction

1. Lindane, the common name for the gamma isomer of hexachlorocyclohexane, is a white crystalline solid, stable in light, heat, air, carbon dioxide and strong acids. Technical hexachlorocyclohexane contains mainly five isomers: alpha hexachlorocyclohexane (53%–70%), beta hexachlorocyclohexane (3%–14%), gamma hexachlorocyclohexane (11%–18%), delta hexachlorocyclohexane (6%–10%) and epsilon hexachlorocyclohexane (3%–5%). The mixture of isomers was largely used as an inexpensive insecticide, but as the gamma isomer is the only isomer showing strong insecticidal properties, it was purified from the mixture and commercialized under the name Lindane (technical grade purity >99%).

2. Lindane (and hexachlorocyclohexane) is listed as a persistent organic pollutant with restricted uses under the Protocol on Persistent Organic Pollutants to the Convention on Long-range Transboundary Air Pollution under the United Nations Economic Commission for Europe. Its restricted uses have recently undergone a mandatory review under the Protocol.

3. The present dossier focuses solely on the information required under paragraphs 1 and 2 of Annex D of the Stockholm Convention and is mainly based on information from the following review reports:

- National Diagnostic Report on Lindane. Mexican National Institute of Ecology (INE). 2004. (http://www.ine.gob.mx/dgicurg/download/Proyectos-2003/EL_LINDANO_EN_MEXICO.pdf)
- Technical Review Report on Lindane. UNECE. 2004 (www.unece.org/env/popsxg/docs/2004/Dossier_Lindane.pdf)
- (Draft) Decision Document on Lindane. Commission for Environmental Cooperation. 2000. (www.cec.org/files/pdf/POLLUTANTS/linddd_en.pdf)
- Toxicological Profile for Hexachlorocyclohexanes (hexachlorocyclohexane), US-ATSDR. 2003 (www.atsdr.cdc.gov/toxprofiles/tp43.html)

4. These reviews also serve as a source of further information referred to in paragraph 3 of Annex D of the Stockholm Convention on this candidate POP chemical.

1. Identification of the chemical

1.1 Names and registry numbers

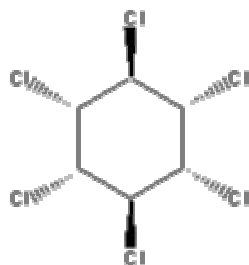
CAS chemical name: gamma, 1,2,3,4,5,6-hexachlorocyclohexane

Synonyms/abbreviations: gamma benzene hexachloride;
gamma-BHC

Trade names: Agrocide, Aparasin, Arbitex, BBH, Ben-hex, Bentox, Celanex, Chloresene, Dvoran, Dol, Entomoxan, Exagamma, Forlin, Gallogama, Gamaphex, Gammalin, Gammex, Gammexane, Hexa, Hexachloran, Hexaverm, Hexicide, Isotos, Kwell, Lendine, Lentox, Linafor, Lindafor, Lindagam, Lindatox, Lintox, Lorexane, Nexit, Nocochloran, Novigam, Omnitox, Quellada, Silvanol, Tri-6, Vitron.

CAS registry number: 58-89-9

1.2 Structure



(Structural formula source: <http://chemfinder.cambridgesoft.com/>)

Molecular formula: $C_6H_6Cl_6$

Molecular weight: 564.7

2. Persistence

5. Lindane has a half-life of 2.3 to 13 days in air, 30 to 300 days in water, 50 days in sediments and two years in soil. It is stable to light, high temperatures and acid but it can be hydrolysed at high pH. Lindane degrades very slowly by microbial action. Lindane is more water-soluble and volatile than other chlorinated organic chemicals, which explains why it is found in all environmental media (water/snow, air, soil/sediments).

3. Bioaccumulation

6. Although lindane has the potential to bioaccumulate easily in the food chain as a result of its high lipid solubility, biotransformation and elimination are also relatively rapid. Lindane has a logK_{ow} of 3.5 and a log bioconcentration factor of 2.26 to 3.85. Nevertheless, lindane can be found in seabirds, fish and mammals in the Arctic and in other regions of the world.

4. Potential for long-range environmental transport

7. Lindane is a volatile compound (vapour pressure 3.83×10^{-3} Pa) which can undergo vaporization and condensation cycles and can be found in remote regions where it is not used, such as the Arctic. Estimated annual loading of lindane to the Arctic is 13,000 kg per year.

8. The transport and deposition processes have led to the accumulation of lindane in all environmental niches in the Arctic. Lindane is measured consistently in Arctic air, sea water and freshwater bodies. Lindane and alpha hexachlorocyclohexane have made up about 75 per cent of the organochlorine compounds measured in snowpack in the Canadian Arctic.

5. Adverse effects

9. Lindane is moderately to highly toxic in acute rat studies, with an oral LD₅₀ ranging from 55 to 480 mg/kg body weight. Acute effects include central nervous system excitation, convulsions, respiratory failure, pulmonary oedema and dermatitis.

10. Several animal studies indicate an association between chronic lindane exposure and aplastic anaemia, convulsions, liver and kidney effects, reduced ability to fight infection and injury to testes and ovaries. The International Agency for Research on Cancer has classified Lindane as carcinogenic in mice.

11. The most common human exposure pathway to Lindane is through food. A direct correlation exists between food intake, especially fish, meat and dairy products, and marine mammals, and lindane concentrations in body fat and human milk.

12. Lindane is reported to be highly toxic to some fish and other aquatic species.

6. Statement of the reasons for concern

13. The proposal of the Government of Mexico contains the following statement of concern:

“Lindane is persistent and is frequently found in environmental compartments. Due to its physicochemical properties it has the potential to be transported long distances. It is ecotoxic and has acute and chronic adverse effects in humans. Pharmaceutical uses, mainly in children, should be of particular concern.

Adding to these data on the harmful effects of Lindane to human health and the environment, is the fact that in the production and purification process to obtain 99% pure gamma hexachlorocyclohexane, for every ton of Lindane produced there are 6–10 metric tonnes of the other isomers that must be disposed of or otherwise managed. Lindane being the only isomer in the mixture that has insecticidal properties, there is very limited to no commercial value for the other isomers obtained. Because of this waste isomer problem, the production of hexachlorocyclohexane/Lindane has been a worldwide problem for years. The International Hexachlorocyclohexane and Pesticide Forum exists in order to bring together experts to solve the problems associated with the clean-up of former hexachlorocyclohexane/lindane production sites.

Other hexachlorocyclohexane isomers can be as toxic, persistent and contaminant as lindane, or even more so. The continued use of lindane in the world is causing this important polluting source. Global action is therefore needed to halt the pollution caused worldwide by lindane and its production.”
