

gamma-Hexachlorocyclohexane (gamma-HCH); CASRN 58-89-9

Human health assessment information on a chemical substance is included in the IRIS database only after a comprehensive review of toxicity data, as outlined in the [IRIS assessment development process](#). Sections I (Health Hazard Assessments for Noncarcinogenic Effects) and II (Carcinogenicity Assessment for Lifetime Exposure) present the conclusions that were reached during the assessment development process. Supporting information and explanations of the methods used to derive the values given in IRIS are provided in the [guidance documents located on the IRIS website](#).

STATUS OF DATA FOR gamma-HCH

File First On-Line 01/31/1987

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	yes	01/31/1987
Inhalation RfC (I.B.)	not evaluated	
Carcinogenicity Assessment (II.)	not evaluated	

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name — gamma-Hexachlorocyclohexane (gamma-HCH)

CASRN — 58-89-9

Primary Synonym — Lindane

Last Revised — 01/31/1987

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk

of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

I.A.1. Oral RfD Summary

Critical Effect	Experimental Doses*	UF	MF	RfD
Liver and kidney toxicity	NOAEL: 4 ppm diet [0.33 mg/kg/day (females)]	1000	1	3E-4 mg/kg/day
Rat, Subchronic Oral Bioassay	LOAEL: 20 ppm diet [1.55 mg/kg/day (males)]			
Zoecon Corp., 1983				

*Conversion Factor -- Converted dose calculated from actual food consumption data

I.A.2. Principal and Supporting Studies (Oral RfD)

Zoecon Corporation. 1983. MRID No. 00128356. Available from EPA. Write to FOI, EPA, Washington D.C. 20460.

Twenty male and 20 female Wistar KFM-Han (outbred) SPF rats/treatment group were administered 0, 0.2, 0.8, 4, 20, or 100 ppm lindane (99.85%) in the diet. After 12 weeks, 15 animals/sex/group were sacrificed. The remaining rats were fed the control diet for an additional 6 weeks before sacrifice. No treatment-related effects were noted on mortality, hematology, clinical chemistry, or urinalysis. Rats receiving 20 and 100 ppm lindane were observed to have greater-than-control incidence of the following: liver hypertrophy, kidney tubular degeneration, hyaline droplets, tubular distension, interstitial nephritis, and basophilic tubules. Since these effects were mild or rare in animals receiving 4 ppm, this represents a NOAEL. The reviewers of the study calculated the dose to be 0.29 mg/kg/day for males and 0.33 mg/kg/day for females, based on measured food intake.

In a 2-year feeding study (Fitzhugh, 1950), 10 Wistar rats/sex/group were exposed to 5, 10, 50, 100, 400, 800, or 1600 ppm lindane. Slight liver and kidney damage and increased liver weights were noted at the 100 ppm level. If a food intake equal to 5% body weight is assumed, a NOAEL of 2.5 mg/kg bw/day (50 ppm) can be determined from this assay. In a 2-year bioassay (Rivett et al., 1978), four beagle dogs/sex/group were administered 0, 25, 50, or 100 ppm lindane in the diet. Treatment-related effects noted in the animals of the 100 ppm group were increased serum alkaline phosphatase and enlarged dark friable livers. A NOAEL was determined to be 50 ppm (1.6 mg/kg bw/day).

I.A.3. Uncertainty and Modifying Factors (Oral RfD)

UF — A factor of 10 each was employed for use of a subchronic vs. a lifetime assay, to account for interspecies variation and to protect sensitive human subpopulations.

MF — None

I.A.4. Additional Studies/Comments (Oral RfD)

Data on reproductive effects of lindane are inconclusive. Most reports indicate that hexachlorocyclohexane isomers are nonteratogenic.

I.A.5. Confidence in the Oral RfD

Study — Medium

Database — Medium

RfD — Medium

The principal study used an adequate number of animals and measured multiple endpoints. Since there are other reported chronic and subchronic studies, confidence in the database is medium. Medium confidence in the RfD follows.

I.A.6. EPA Documentation and Review of the Oral RfD

Source Document — U.S. EPA, 1985

The RfD in the Drinking Water Criteria Document has been extensively reviewed by U.S. EPA scientists and selected outside experts.

Other EPA Documentation — None

Agency Work Group Review — 01/22/1986

Verification Date — 01/22/1986

I.A.7. EPA Contacts (Oral RfD)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name — gamma-Hexachlorocyclohexane (gamma-HCH)

CASRN — 58-89-9

Primary Synonym — Lindane

Not available at this time.

II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — gamma-Hexachlorocyclohexane (gamma-HCH)

CASRN — 58-89-9

Primary Synonym — Lindane

Not available at this time.

III. [reserved]

IV. [reserved]

V. [reserved]

VI. Bibliography

Substance Name — gamma-Hexachlorocyclohexane (gamma-HCH)

CASRN — 58-89-9

Primary Synonym — Lindane

VI.A. Oral RfD References

Fitzhugh, O.G., A.A. Nelson and J.P. Frawley. 1950. The chronic toxicities of technical benzene hexachloride and its alpha, beta and gamma isomers. *J. Pharmacol. Exp. Ther.* 100: 59-66.

Muller, D., H. Klepel, R.M. Macholz, H.J. Lewerenz and R. Engst. 1981. Electroneurophysiological studies on neurotoxic effects of hexachlorocyclo- hexane isomers and gamma-pentachlorocyclohexene. *Bull. Environ. Contam. Toxicol.* 27(5): 704-706.

Rivett, K.F., H. Chesterman, D.N. Kellett, A.J. Newman, and A.N. Worden. 1978. Effects of feeding lindane to dogs for periods of up to 2 years. *Toxicology.* 9: 273-289.

U.S. EPA. 1985. Drinking Water Criteria Document for Lindane. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

Zoecon Corporation. 1983. MRID No. 00128356. Available from EPA. Write to FOI, EPA, Washington, DC 20460.

VI.B. Inhalation RfC References

None

VI.C. Carcinogenicity Assessment References

None

VII. Revision History

Substance Name — gamma-Hexachlorocyclohexane (gamma-HCH)

CASRN — 58-89-9

Primary Synonym — Lindane

Date	Section	Description
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VIII. Synonyms

Substance Name — gamma-Hexachlorocyclohexane (gamma-HCH)

CASRN — 58-89-9

Primary Synonym — Lindane

Last Revised — 01/31/1987

- 58-89-9
- AALINDAN
- AFICIDE
- AGRISOL G-20
- AGRONEXIT
- AMEISENATOD
- AMEISENMITTEL MERCK
- APARASIN
- APHTIRIA
- APLIDAL
- ARBITEX
- BBH
- BEN-HEX
- BENTOX 10
- gamma-BENZENE HEXACHLORIDE
- BENZENE HEXACHLORIDE-gamma-isomer
- BEXOL
- BHC
- gamma-BHC
- CELANEX
- CHLORESENE
- CODECHINE
- CYCLOHEXANE, 1,2,3,4,5,6-HEXACHLORO-, gamma-isomer
- DBH
- DETMOL-EXTRAKT
- DETOX 25
- DEVORAN
- DOL GRANULE
- DRILL TOX-SPEZIAL AGLUKON

- ENT 7,796
- ENTOMOXAN
- EXAGAMA
- FORLIN
- GALLOGAMA
- GAMACARBATOX
- GAMACID
- GAMAPHEX
- GAMENE
- GAMISO
- GAMMA-COL
- GAMMAHEXA
- GAMMAHEXANE
- GAMMALIN
- GAMMALIN 20
- GAMMATERR
- GAMMEX
- GAMMEXANE
- GAMMOPAZ
- GEXANE
- HCCH
- HCH
- gamma-HCH
- HECLOTOX
- HEXA
- HEXACHLORAN
- HEXACHLORANE
- gamma-HEXACHLORANE
- gamma-HEXACHLORAN
- gamma-HEXACHLOR
- gamma-HEXACHLOROBENZENE
- 1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE
- 1-alpha,2-alpha,3-beta,4-alpha,5-alpha,6-beta-HEXACHLOROCYCLOHEXANE
- Hexachlorocyclohexane, gamma-
- gamma-1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE
- 1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE, gamma-ISOMER
- HEXACHLOROCYCLOHEXANE, gamma-ISOMER
- HEXATOX
- HEXAVERM
- HEXICIDE
- HEXYCLAN
- HGI
- HORTEX
- INEXIT
- ISOTOX

- JACUTIN
- KOKOTINE
- KWELL
- LENDINE
- LENTOX
- LIDENAL
- LINDAFOR
- LINDAGAM
- LINDAGRAIN
- LINDAGRANOX
- Lindane
- gamma-LINDANE
- LINDAPOUDRE
- LINDATOX
- LINDOSEP
- LINTOX
- LOREXANE
- MILBOL 49
- MSZYCOL
- NA 2761
- NCI-C00204
- NEO-SCABICIDOL
- NEXEN FB
- NEXIT
- NEXIT-STARK
- NEXOL-E
- NICOCHLORAN
- NOVIGAM
- OMNITOX
- OWADZIAK
- PEDRACZAK
- PFLANZOL
- QUELLADA
- RCRA WASTE NUMBER U129
- SANG gamma
- SILVANOL
- SPRITZ-RAPIDIN
- SPRUEHPFLANZOL
- STREUNEX
- TAP 85
- TRI-6
- VITON