

OPERATION OF THE PRIOR INFORMED
CONSENT PROCEDURE FOR BANNED
OR SEVERELY RESTRICTED CHEMICALS
IN INTERNATIONAL TRADE

DECISION GUIDANCE DOCUMENTS

Dieldrin

JOINT FAO/UNEP PROGRAMME
FOR THE OPERATION OF
PRIOR INFORMED CONSENT



UNEP

United Nations Environment Programme



Food and Agriculture Organization
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Rome - Geneva 1991

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The inclusion of these chemicals in the Prior Informed Consent Procedure is based on reports of control action submitted to the United Nations Environment Programme (UNEP) by participating countries, and which are presently listed in the UNEP-International Register of Potentially Toxic Chemicals (IRPTC) database on Prior Informed Consent. While recognizing that these reports from countries are subject to confirmation, the FAO/UNEP Joint Working Group of Experts on Prior Informed Consent have recommended that these chemical be included in the Procedure. The status of these chemicals will be reconsidered on the basis of such new notifications as may be made by participating countries from time to time.

The use of trade names in this document is primarily intended to facilitate the correct identification of the chemical. It is not intended to imply approval or disapproval of any particular company. As it is not possible to include all trade names presently in use, only a number of commonly used and published trade names have been included here.

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ABBREVIATIONS WHICH MAY BE USED IN THIS DOCUMENT

(n.b.: chemical elements and pesticides are not included in this list)

ADI	acceptable daily intake
ai	active ingredient
b.p.	boiling point
bw	body weight
° C	degree Celsius (centigrade)
CCPR	CODEX Committee on Pesticide Residues
DNA	Designated National Authority
EC	emulsion concentrate
EEC	European Economic Community
EPA	U.S. Environmental Protection Agency
ERL	extraneous residue limit
FAO	Food and Agriculture Organization of the United Nations
g	gram
µg	microgram
GAP	good agricultural practice
GL	guideline level
ha	hectare
HEOD	
IARC	International Agency for Research on Cancer
i.m.	intramuscular
i.p.	intraperitoneal
IPCS	International Programme on Chemical Safety
IRPTC	International Register of Potentially Toxic Chemicals
JMPR	Joint FAO/WHO Meeting on Pesticide Residues (Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and a WHO Expert Group on Pesticide Residues)
k	kilo- (x 10 ³) kilogram
kg	kilogram
l	litre
LC ₅₀	lethal concentration, 50%
LD ₅₀	lethal dose, median
m	metre
mg	milligram
ml	millilitre
m.p.	melting point

MRL	Maximum Residue Limit. (For difference between draft MRLs and Codex MRLs, see the introduction Annex I.)
MTD	maximum tolerated dose
ng	nanogram
NOEL	no-observed-effect level
NOAEL	no-observed-adverse-effect level
NS	Not Stated
OP	organophosphorus pesticide
PHI	pre-harvest interval
ppm	parts per million (Used only in reference to concentration of a pesticide in an experimental diet. In all other contexts the terms mg/kg or are used).
sp gr	specific gravity
STEL	Short Term Exposure Limit
TADI	Temporary Acceptable Daily Intake
TLV	Threshold Limit Value
TMDI	Theoretical maximum daily intake
TMRL	Temporary Maximum Residue Limit
TWA	Time Weighted Average
UNEP	United Nations Environment Programme
WHO	World Health Organization
WP	wettable powder
wt	weight
<	less than
<<	much less than
≤	less than or equal to
>	greater than
≥	greater than or equal to

DIELDRIN

PRIOR INFORMED CONSENT DECISION GUIDANCE DOCUMENT

1. IDENTIFICATION

- 1.1 Common Name: Dieldrin
- 1.2 Chemical Type: Organochlorine
- 1.3 Use: Pesticide (insecticide)
- 1.4 Chemical Name: 3, 4, 5, 6, 10, 9 - hexachloro - 1a, 2, 2a, 3, 6, 6a, 7, 7a - octahydro 2, 3:3, 6 - dimethanonaph(2,3-b) - oxirene (HEOD)
- 1.5 CAS No.: 60-57-1
- 1.6 Trade Names/Synonyms: HEOD, Dioldrex, Dioldrite, Octalox, Panoram D-31, Compound 497, Dioldrine; Discontinued name: Alvit
- 1.7 Mode of Action: Central nervous system stimulant producing convulsions
- 1.8 Formulation Types: Emulsifiable concentrate (18-20% a.i.), wettable powder (50 and 75%), granules (2 and 5%), dust (2%), seed dressing, solutions (up to 20%)
- 1.9 Basic Producer: Shell International Chemical (NL)

2. SUMMARY OF CONTROL ACTIONS

- 2.1 General: Thirty-three countries have reported either banning dieldrin completely or severely restricting its use. At least twenty-one countries, including all members of the European Community falling within the jurisdiction of a 1979 EEC Directive, have prohibited all uses of the compound except for a few relatively minor uses. Another twelve countries have banned most uses, but allow continued application in a few specific cases. Specific actions reported by governments are summarized in Annex 1.
- 2.2 Reasons for the Control Action: Dieldrin and aldrin, which rapidly convert to dieldrin in the environment and in the human body, have been subjected to control actions principally due to their high toxicity to man and many animals, to their persistence in the environment, especially in temperate areas, and to their bioaccumulation in the food chain and in human tissues. Dieldrin is highly toxic to fish, crustaceans, and many bird and animal species, and is highly toxic to human beings, with short-term, high levels of exposure causing headache, dizziness, and tremors followed by convulsions, loss of consciousness and possibly death. Oral doses of aldrin and dieldrin have caused liver cancer in mice but not rats.
- 2.3 Used Banned: In most cases, all uses are banned. In other countries, as described in following section and in Annex 1, all uses are prohibited except those specifically authorized.

- 2.4 Uses Reported to be Continued in Effect: Termite control is the most common allowable use among countries still authorizing some uses. The compound is also permitted in certain countries for a few agricultural or public health purposes: banding of coffee trees (Kenya), dipping of non-food roots and tops and moth-proofing by manufacturing processes in closed systems (USA), vector control, ant control in granular form on soils and emergency agricultural use (Venezuela). See Annex 1 for details.
- 2.5 Alternatives: Countries controlling aldrin and dieldrin have found many alternatives for designated purposes.
- 2.6 Contacts for Further Information: FAO/UNEP Joint Data Base, IRPTC Geneva; Designated National Authorities in countries taking control actions.

3. **SUMMARY OF FURTHER INFORMATION ON DIELDRIN**

3.1 Chemical and Physical Properties: Technical grade dieldrin (95% HEOD) is in the form of solid flakes, buff to light tan in colour. It is practically insoluble in water but soluble in most organic solvents except aliphatic petroleum solvents and methanol. It is stable to alkali, mild acids, and light but reacts with concentrated acids, acid catalysts, acid oxidizing agents and active metals such as iron and copper.

3.2 Toxicological Characteristics:

3.2.1 Acute Toxicity: Rat Oral LD₅₀: 37-167 mg/kg depending upon vehicles used. Rat Dermal LD₅₀: 90 mg/kg (males), 60 mg/kg (females). Rabbit Dermal LD₅₀: 250-360 mg/kg depending on formulation and vehicle.

WHO Classification: a.i. Class Ia - extremely hazardous.

Formulations: For solids, above 60% a.i., Class Ib; between 10 and 60%, Class II; below 10%, Class III. For liquids, above 15%, Class Ib, between 1 and 15%, Class II; below 1%, Class III.

3.2.2 Short-Term Toxicity: In both humans and animals, the primary acute toxic effects are on the central nervous system, including hyperexcitability and tremors followed by convulsions and possibly death. The liver is also a target organ. Dieldrin has been found to cause immunosuppression in mice. No teratogenic effects have been observed in either humans or in animals below levels causing maternal toxicity. Fetuses are affected through transplacental exposure. The overall no-observed-adverse-effect level in the rat is 0.5 mg dieldrin/kg diet, equivalent to 0.025 mg/kg bw: in the dog, the lowest no-observed-adverse-effect level is 0.04 mg/kg bw. The lowest reported dose fatal to man has been estimated to be 5 mg/kg bw.

3.2.3 Chronic Toxicity: Weight of the evidence demonstrates no mutagenic potential. IARC states that there is inadequate evidence of carcinogenicity in man and limited evidence of carcinogenicity in experimental animals, and accordingly classifies both aldrin and dieldrin in category 3, possible human carcinogens. In the USA, the Environmental Protection Agency has classified aldrin and dieldrin as probable human carcinogens, based on experimental evidence of liver cancer in mice but not rats.

JMPR/Codex ADI: 0-0.0001 mg/kg bw (combined total for aldrin and dieldrin).

- 3.2.4 Epidemiological Studies: A study in 1981 showed a slight increase in human cancer incidence, but mixed exposures confound the interpretation of the results. A study of workers in a Dutch manufacturing plant revealed no excess cancers and mortality was lower than expected. A no-effect level of 105 µg/l, equivalent to a daily intake of 1220 µg/person, was established on a group of workers at the same plant, based on liver enzyme induction measurement. Available human studies indicate no specific carcinogenic activity.
- 3.3 Environmental Characteristics:
- 3.3.1 Fate: The half-life of dieldrin in temperate soils is estimated to be about five years. In tropical areas, dieldrin is lost more quickly, up to 90% disappearing within one month. Resistance to soil leaching generally precludes groundwater contamination, although there is some risk of surface runoff. Biomagnification is high, estimated at 5,957 in fish and 11,149 in snails.
- 3.3.2 Effects: Highly toxic to fish and crustaceans (LC₅₀s ranging from 2.2 to 53 µg/l). Toxicity of dieldrin for higher plants is low, even less than that of aldrin. Toxicity to birds has been found to vary by species between 6.9 and 381 mg/kg bw; response among mammals varies by species.
- 3.4 Exposure:
- 3.4.1 Food: The dietary contribution, arising from bioaccumulation in the food chain and, less probably, contaminated drinking water, is thought to be the most significant route of human exposure. Monitoring analyses undertaken by FAO/WHO for the period 1971-81 in Australia, Canada, Guatemala, Japan, New Zealand, the USA and the UK found mean daily intakes varying between 0.007 to 0.056 micro g/kg bw (aldrin and dieldrin combined), below recommended ADI levels.
- 3.4.2 Occupational/Use: Dieldrin can be absorbed into the body both through skin contact and inhalation at the manufacturing, formulating and application stages. One or more gross overexposures can lead to acute convulsive intoxication; a greater number of smaller doses may cause accumulative intoxication. A time-weighted average TLV for exposure to aldrin and dieldrin has been set at 0.25 mg/m³. One fatal overexposure of an applicator has been reported.
- 3.4.3 Environment: Exposure from air is of minor importance to the general population. Monitoring studies in the USA, UK, Netherlands, Barbados, and Ireland between 1965 and 1981 found mean concentrations ranging from 0.073 to 49 ng/m³. Higher exposure rates to air-borne dieldrin can be expected after its use in homes for termite control or as a remedial treatment for inside wood. Mean dieldrin levels found in inside air one to ten years after application in the UK ranged from 0.01 and 2.7 µg/m³. Low levels of dieldrin in surface water have been reported in several countries.
- 3.4.4 Accidental Poisoning: No recent data are available.
- 3.5 Measures to Reduce Exposure: Respiratory and dermal protection can reduce exposure to workers and users. Because of its persistence and bioaccumulation, exposure to the general population and environment can be reduced primarily by reducing use.
- 3.6 Packaging and Labelling: Follow FAO Guidelines on Good Labelling Practice.

- 3.7 Waste Disposal Methods: Guidelines are under development. This section will be updated when guidelines are available.
- 3.8 Maximum Residue Limits. (mg/kg, aldrin and dieldrin combined): JMPR/Codex: potatoes, 0.1; meat fat, 0.2E: carrots, lettuce, 0.1E: asparagus, aubergines, broccoli, Brussels sprouts, cabbage, cauliflower, cucumbers, horse radish, onions, parsnips, peppers, pimentos, radishes, radish tops, 0.1; eggs (shellfree), 0.1E; milk, 0.006E; fruit, 0.05, rice (in husks), 0.02; other raw cereals, 0.02E. (E = extraneous residue limits).

US: Tolerances for residues of aldrin and dieldrin in or on various foodstuffs are set at 0, 0.02, 0.05 or 0.1 ppm.

WHO has recommended that the level of aldrin and dieldrin in drinking water should not exceed 0.03 µg/l.

4. **MAJOR REFERENCES**

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ANNEX 1
SUMMARY OF CONTROL ACTIONS AND REMAINING USES FOR DIELDRIN,
AS REPORTED BY COUNTRIES

BANNED:

Belize	(NS)	Banned as agricultural chemical.
Ecuador	(1985)	Banned.
EEC-countries *	(1988)	Banned as agricultural chemical.
Liechtenstein	(1986)	Banned.
Mexico	(1982)	Banned as agricultural chemical.
Panama	(1987)	Banned as agricultural chemical.
Singapore	(1984)	Banned.
Sweden	(1969)	Banned.
Switzerland	(1986)	Banned.
Yugoslavia	(1982)	Banned.

WITHDRAWN:

None reported.

SEVERELY RESTRICTED:

Dominica (NS) Severely restricted pesticide.

Mauritius (1970) Restricted use under the Pesticide Control Act of 1970.

Poland (NS) No longer used in sanitary hygiene.

Only remaining uses allowed:

Colombia (1988) Only allowed for treatment of timber.

Kenya (1987) Only for termite control and banding of coffee trees for ant control.

Republic of Korea (1986) Sale and use prohibited except for production of industrial goods.

Togo (1977) Only allowed for use against termites outside food producing culture zones.

USA (1974) All uses cancelled except for subsurface ground insertion for termite control, dipping of non-food roots and tops, moth-proofing by manufacturing process in a closed system.

Venezuela (1983) Only permitted when intended for control of vectors for medical reasons by Ministry of Health, control of agricultural pests by Ministry of Agriculture.

Specific uses reported as not allowed:

Argentina 1968-69 Prohibited for use as turcuricide (glow-worm killer) (1968) and for use in treatment of natural and artificial meadows, treatment of cattle, sheep, goats, swine and horses

* EEC-countries - Belgium, Denmark, France, Federal Republic of Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and United Kingdom.

and in human food products of animal or plant origin (1969).

Chile (1983) Not allowed on natural or artificial meals directly or in concentrated form as animal feed. Prohibited on seeds, grain, etc.

Use permitted only with special authorization:

Japan (1981) Manufacture and import prohibited without authorisation by the Government. Uses other than those specified by Cabinet order are prohibited. Prohibition of import of specified products containing this substance.

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