

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

# DECISION GUIDANCE DOCUMENTS

**Hexachlorobenzene**

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



**UNEP**

United Nations Environment Programme



Food and Agriculture Organization  
of the United Nations

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Food and Agriculture Organization of the United Nations  
United Nations Environment Programme  
Rome - Geneva 1991; amended 1996

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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 has recommended that these chemicals 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
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 <sup>3</sup> )
kg	kilogram
l	litre
LC <sub>50</sub>	lethal concentration, 50%
LD <sub>50</sub>	lethal dose, median

m	metre
mg	milligram
ml	millilitre
m.p.	melting point
MRL	Maximum Residue Limit.
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
ppb	parts per billion
ppm	parts per million (Used only in reference to the concentration of a pesticide in an experimental diet. In all other contexts the terms mg/kg or mg/l are used).
ppt	parts per trillion
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



## Prior Informed Consent Decision Guidance Document

# Hexachlorobenzene

## 1 Identification

1.1	Common Name	Hexachlorobenzene
	Other names/synonyms	HCB, Perchlorobenzene
1.2	Chemical Type	Chlorinated aromatic
1.3	Use	Pesticide - seed protectant (fungicide). HCB can be generated as a by-product during the manufacture of chlorinated pesticides, chlorine and chlorinated solvents.
1.4	Chemical Name	Hexachlorobenze (IUPAC, CA)
1.5	CAS No.	118-74-1
1.6	Trade Names	Anti-Carie, Ceku C.B., hexachlorobenzol, hexachlorobenzene, HCB, perchlorobenzene, No Bunt., Bent-cure, Bent-no-more
1.7	Mode of action as Pesticide	Fumigant action on fungal spores
1.8	Formulation Types	Dust powder, dry seed treatment (DS), slurry for seed treatment (WS), often in combination with other seed protectants.
1.9	Basic Manufacturers	Cequisa, Compañía Química S.A., Hightex

## 2 Summary of Control Actions

### 2.1 General

Control actions to ban or severely restrict the use of hexachlorobenzene as a pesticide or in agriculture have been reported by six countries and the Member States of the European Union (EU) and the Members associated with the EU in the European Economic Area. In the USA, the registrant has voluntarily withdrawn the substance.

*The actions reported by governments to IRPTC/UNEP are listed in Annex 1.*

### 2.2 Reasons for the Control Actions

Reasons given for banning hexachlorobenzene include its very high persistency in the environment and its bioaccumulation in the food chain. Two countries indicate concern on health effects, including carcinogenicity. (*Refer to Annex 1 for details.*)

### 2.3 Bans and restrictions

All countries reported that no pesticide use was permitted.

**2.4 Uses Reported to be Continued in Effect**

No uses are reported.

**2.5 Alternatives**

Specific alternatives were suggested by Australia (Annex 2). Morocco and Austria indicated that alternatives are available, but made no specific recommendations.

*It is important to remember that the effectiveness of any alternative pesticide needs to be established under conditions of use in specific crops and countries.*

**2.6 Contacts for Further Information**

*FAO/UNEP Joint Data Base, IRPTC, Geneva; Designated National Authorities (DNAs) in countries taking control actions may be a source of information on alternatives (Annex 3).*

<b>3 Summary of Further Information on Hexachlorobenzene</b>
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<b>3.1 Chemical and Physical Properties</b>
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HCB is a colourless crystalline solid. Melting point 226°C, techn. Grade >220°C, boiling point 323-326°C. Vapour pressure 1.45 mPa at 20°C. Very stable even to acids and alkalis. Log Octanol/water partition coefficient 5.5. Soluble in ether, benzene, chloroform; sparingly soluble in cold ethanol; practically insoluble in water (20°C); 0.006 g/l (Pesticide Manual, 1994).

<b>3.2 Toxicological Characteristics</b>
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**3.2.1 Classification**

WHO	Category 1a (Extremely hazardous) (WHO, 1994)
EU	Toxic, probable human carcinogen
IARC	Group 2B (sufficient evidence for carcinogenicity to animals and inadequate evidence for carcinogenicity to humans) (IARC, 1987)
US-EPA	Probable human carcinogen (US EPA, 1985)

**3.2.2 General**

**Metabolism** The principal metabolites in mammals are pentachlorophenol, tetrachlorohydroquinone and pentachlorothiophenol, with lesser amounts of tetrachlorobenzene, pentachlorobenzene, 2,4,5- and 2,4,6- trichlorophenols and 2,3,4,6- and 2,3,5,6-tetrachlorophenols (Royal Society of Chemistry, 1991).

**3.2.3 Acute Toxicity**

Oral	LD <sub>50</sub> 1,700 (cat)- 10,000 (rat) mg/kg (IARC, 1979)
Irritation	Slight skin irritation may occur after exposure (Pesticide Manual, 1994)

Although, a single dose of hexachlorobenzene has a low toxicity, even fairly small repeated doses can be toxic.



### 3.2.4 Short-term Toxicity

An NOEL of 0.05 mg/kg bw/day was found after 90 days of oral exposure in the monkey based upon enzyme induction and increased excretion of blood cell pigments. Increased liver weight was observed after 19 weeks of oral administration of 0.4 mg/kg bw/day in the rat. The NOEL was 0.08 mg/kg bw/day. Other effects observed in short-term studies include immunological changes in rats and neurological effects in rats and dogs (IPCS).

#### Reproduction

Relatively low doses of HCB have affected the reproductive tissues in female monkeys. Results of studies on a variety of species have indicated that repeated exposure to relatively high doses of HCB can affect male reproduction. Placental and lactational transfer of HCB, demonstrated in a number of species, can adversely affect both the foetus and nursing offspring. Adverse effects on suckling infants are generally observed more frequently, and at lower doses than embryotoxic or foetotoxic effects. (IPCS, 1996).

### 3.2.5 Chronic Toxicity Carcinogenicity

HCB has been found to be carcinogenic in mice, rats and hamsters based upon increased incidences of tumours of the liver, thyroid, adrenal and blood vessels (IARC, 1987).

### 3.2.6 Epidemiological Data

Approximately 3,000 people in Turkey were estimated to have been exposed, during the period 1955 to 1959, to wheat intended as seed corn treated with hexachlorobenzene, and more than 600 cases of *porphyria cutanea tarda* were reported. Extremely high mortality was observed in nursing infants. Children exposed to contaminated bread had short stature, atrophied hands and fingers, osteoporosis and arthritic changes. It was estimated that the consumption of 50-200 mg/day over a long period of time resulted in toxicity. Abnormal porphyrin metabolism persisted for at least 20 years after the contamination (IPCS, 1996).

## 3.3 Environmental Characteristics

### 3.3.1 Fate

Hexachlorobenzene is widely distributed in the environment by virtue of its mobility and resistance to degradation. HCB is very persistent. It is tightly bound to soil and sediments. The half-life in soil has been estimated at 3 to 6 years. Due to its binding to soil and its very low solubility in water, hexachlorobenzene does not readily leach into water.

HCB is a bioaccumulative substance (BCF values range from 375 to >35,000).

### 3.3.2 Effects

**Fish** LC<sub>50</sub>/96 hrs 0.05 - 0.2 mg/l (moderately to highly toxic)

- Birds** HCB has the potential to harm embryos of sensitive bird species (IPCS)  
**Bees** Not toxic to bees

### 3.4 Exposure

- 3.4.1 Food/drinking water** Food intake is the primary source of exposure of the general population. HCB residues have appeared in a wide variety of foods and have been commonly found in meat, milk and eggs. It can be absorbed from the gastro-intestinal tract or by inhalation of dust. The average intake in the USA in the years 1978 to 1982 was estimated to be below 0.01 µg/day. Dietary intake in Japan was estimated to be 0.5µg/day in 1977. HCB is stored in the body fat. Due to the accumulation of HCB in breast milk, estimated intakes by nursing infants are higher: breast-fed infants in Australia and Norway were estimated to consume up to 40 µg/day in the mid-1970s. Levels in drinking water were found to average 0.1 ng/l in one study in Canada.
- 3.4.2 Occupational/Use** Workers in some industries may be exposed to a much greater extent than the general population. Air concentration as high as 150,000 ng/m<sup>3</sup> .have been measured in industrial plants. Air concentrations as high as 16,000 ng/m<sup>3</sup>. Have been measured near chemical waste landfills.
- 3.4.3 Environment** Airborne dust particles containing HCB have been a major source of exposure near industrial sites. Urban air levels have been estimated to contain 0.3 ng/m<sup>3</sup>. Concentrations in lake sediments had up to 460 µg/kg in layers of sediment corresponding to the peak usage years 1971 to 1976. Traces of HCB have been found as impurities in some pesticides (IPCS, 1996)
- 3.4.4 Accidental Poisoning** See section 3.2.4 above.

### 3.5 Measures to Reduce Exposures

Although no studies are available concerning dermal absorption, protective clothing and gloves should be worn when handling HCB and excessive dust should be avoided. Dressed seed should not be handled more than necessary (FAO, 1977). The volatility of HCB is low and inhalation exposure is minimal from pesticidal uses. Exposure to the general population occurs primarily through the consumption of contaminated food, with the highest concentration found in meat and milk.

### 3.6 Packaging and Labelling

Labels should include precautions and warnings related to applicator, handler and worker exposure, as well as, hazards to aquatic organisms. Refer to the FAO Revised Guidelines on Good Labelling Practice for Pesticides (FAO, 1995).

### 3.7 Waste Disposal Methods (WHO/IPCS, 1990)

In disposing of hexachlorobenzene, care should be taken to avoid contamination of soil and natural waters. No specific disposal methods are available. Detailed guidelines are under development.

### 3.8 Maximum Residue Limits (mg/kg)

The conditional ADI of 0.0006 mg/kg bw, which had been established, was withdrawn by the Joint FAO/WHO Meeting on Pesticide Residues in 1978 (FAO, 1979).

## 4 Major References

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- Worthing, C.R. and R.J. Hance (Eds.) (1994) The Pesticide Manual: A World Compendium (10th ed.). British Crop Protection Council, Surrey, United Kingdom

## ANNEX 1

## Summary of Control Actions and Remaining Uses as Reported by Countries

### Actions taken and year effective

#### Bans

Australia	
Control Action	Importation of the chemical is prohibited unless specifically approved by the Government. All uses discontinued (dates vary from state to state)
Effective	1987
Uses still allowed	No remaining uses allowed
Reasons for control action	The persistence of the chemical makes it environmentally unacceptable

EU/EEA <sup>1</sup>	
Control Action	It is prohibited to use or place on the market all plant protection products containing hexachlorobenzene
Effective	1979
Uses still allowed	No remaining uses are allowed.
Reasons for control action	Hexachlorobenzene is persistent in the environment. It is likely to bioaccumulate and produce a food-chain effect on terrestrial and aquatic organisms.

Japan	
Control Action	The substance is banned for use
Effective	1979
Uses still allowed	No remaining uses are allowed
Reasons for control action	Prevention of pollution of the environment by chemical substances which have persistence and which may possibly be harmful to human health

Morocco	
Control Action	Banned for use in agriculture
Effective	1984
Uses still allowed	No remaining uses allowed
Reasons for control action	Persistence in the environment

<sup>1</sup> Members of the European Union (EU): Austria, Belgium, Denmark, Finland, France, Germany Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom  
Members of the European Economic Agreement (EEA): Iceland, Liechtenstein, Norway

<b>New Zealand</b>	
Control Action	All uses and products banned
Effective	1972
Uses still allowed	No uses allowed
Reasons for control action	Environmental persistence

<b>Switzerland</b>	
Control Action	Totally banned chemical: Manufacture, supply, import and use of the substance and of products which contain the substance are prohibited
Effective	1986
Uses still allowed	
Reasons for control action	Long persistence, bioaccumulation

## Voluntary Withdrawals

<b>United States</b>	
Control Action	The substance has been voluntarily withdrawn by the registrant. EPA reviewed HCB for carcinogenic and other health effects resulting from dietary and dermal exposure and, as a result, the registrants voluntarily cancelled products containing HCB in June 1984
Effective	1984
Uses still allowed	No remaining uses allowed. There are no registered pesticides that contain HCB as an active ingredient. However, HCB appears as a contaminant in five registered pesticides (chlorothalonil, PCNB, dacthal, picloram and pentachlorophenol) and is a suspected contaminant in several others
Reasons for control action	Based on animal test data, EPA classified HCB as a probable human carcinogen in 1985. HCB is also extremely persistent in the environment. Residues have been found in aquatic and terrestrial species, including man. Particularly high levels have been found in certain fish species. There is also concern over the possibility of HCB causing reproductive effects in wildlife exposed to frequent or continuous low levels of the compound. This concern is especially focused on carnivores and higher mammals.

**ANNEX 2****Alternatives**

*The following alternatives were noted by countries reporting import decisions under the PIC procedure:*

Country	
Austria	Many alternatives for designated purposes
Australia	Bitertanol, carboxin, flutriafol, metalaxyl, tebuconazole, TCMTB, thiram & triadimenol
Morocco	Alternative products are new fungicides used for treatment of seeds

*It is essential that before a country considers substituting any of these reported alternatives, it ensures that the use is relevant to its national needs. A first step may be to contact the DNA in the country where the alternative has been reported (see address: Annex 3). It will then be necessary to determine the compatibility with national crop protection practices.*

## ANNEX 3

## List of Pesticide DNAs in Countries Reporting Control Actions or Alternatives

Australia	P	Mr. Ian Coleman Agricultural and Veterinary Chemicals Policy Section Dept. of Primary Industries and Energy GPO Box 858 Canberra ACT 2601	Tel.: 0061 6 271 6371 Fax.: 0061 6 272 5899 Email: icoleman@dpi.gov.au
	C	Assistant Secretary Environment Standard Branch Environment Protection Agency (EPA) 40 Blackall St. Barton ACT 2600 (Attn.: Ms. Kaye Dal Bon)	Fax: 616 274 1172 Tel: 616 274 1757
European Union	CP	The Director-General Directorate General XI Environment, Nuclear Safety and Civil Protection European Commission Rue de la Loi 200 B-1049 Brussels Belgium (Attn: Mr. M. Debois)	Tel.: 32 2 2990349 Fax: 32 2 2956117 E-mail: dutilleux.j@mhsg.cec.be Telex: COMEU B 21877
Japan	P	The Director Plant Protection Division Ministry of Agriculture, Forestry and Fisheries Kasumigaseki 1-2-1 Chiyoda-ku Tokyo 100 (Attn.: Mr Toshiki Kanamori)	Tel: 81 3 35013964 Fax: 81 3 35916640
	CP	The Director Global Issues Division Multilateral Cooperation Dept. Ministry of Foreign Affairs 2-2-1 Kasumigaseki Chiyoda-ku Tokyo - 100 (Attn.: Mr Toshiki Kanamori)	Tel: 81 3 35803311 Fax: 81 3 35920364
Morocco	P	M. le secrétaire général Ministère de l'agriculture et de la mise en valeur agricole Direction de la protection des végétaux, des contrôles techniques et de la répression des fraudes Avenue de la Victoire BP 1308 Rabat	Tel. 212 (7) 771078
New Zealand	CP	Mr. D.W. Lunn Chief Scientist (Pesticides) Agricultural Compounds Unit Ministry of Agriculture & Fisheries P.O. Box 40-063 Upper Hutt	Tel: 064 4 528-6089 Fax: 064 4 528-4675

Hexachlorobenzene

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	<b>C</b>	Industrial and consumer product chemicals	_____
	<b>P</b>	Pesticides	_____
	<b>CP</b>	Pesticides, industrial and consumer product chemicals	_____