PAN International
List of
Highly Hazardous Pesticides
(PAN List of HHP)



Hamburg - January 16th, 2009

This 'PAN International List of Highly Hazardous Pesticides'
has been drafted by Pesticide Action Network Germany
for 'Working Group 1: Pesticides & Corporations of
Pesticide Action Network International.

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About this publication

For decades, the distribution and use of hazardous pesticides is an issue of concern. Since it's founding in 1982, Pesticide Action Network (PAN) has been the civil society organisation (CSO) most steadily and continuously calling for effective international action towards the elimination of hazardous pesticides. And PAN has been one of the key driving forces among non gorvernmental organisations (NGOs) for improving plant protection policies towards safer, socially just and economically viable pest management systems.

In 1985, the "Code of Conduct on the Distribution and Use of Pesticides" was adopted by FAO to respond to the growing evidence of risks associated with the use of pesticides. Already this first version of the Code indirectly questioned the "safe use" concept as an overall approach to solve pesticide related problems, as it says in Article 5.2.3 that industry should halt sale and recall products when handling or use pose an unacceptable risk under any use directions or restrictions. And since the 1980th a number of international instruments and guidelines have been adopted[1] to tackle pesticide related problems. Additionally, many public and private initiatives have been implemented to reduce the adverse effects of pesticide use in agriculture. However, overall the initiatives have been successful only to a limited extent and the concept of a safe use of highly hazardous pesticides has been questioned increasingly by NGOs/CSOs, scientists, governmental representatives and in the private sector.

Meanwhile initiatives in food, forest and flower production and distribution chain resulted in black lists for some pesticides. In June 2008 the Agricultural Council of the European Union agreed on a common position regarding new rules for placing pesticides on the EU market and decided that substances proven to be carcinogenic, mutagenic or toxic for reproduction shall not be authorized in the EU.

In November 2006 the FAO Council discussed and endorsed SAICM, the Strategic Approach to International Chemicals Safety. In view of the broad range of activities envisaged within SAICM, the Council suggested that the activities of FAO could include ***risk reduction, including the progressive ban on highly hazardous pesticides***, promoting good agricultural practices, ensuring environmentally sound disposal of stock-piles of obsolete pesticides and capacity-building in establishing national and regional laboratories.

In April 2007 the FAO Council informed COAG[2] of its intention to develop a new initiative for pesticide risk reduction. COAG welcomed the initiative to reduce risks associated with the use of hazardous pesticides including the progressive ban on highly hazardous pesticides.

In October 2007 the FAO Panel of Experts on Pesticide Management discussed the so-called thought starter "*Addressing Highly Toxic Pesticides (HTPs)*" with a note from the Secretariat explaining: "*Through this thought-starter FAO wishes to start its work on highly hazardous pesticides.*" (...) "*This thought-starter builds on the information document provided to COAG on pesticide risk reduction [3]. As a first step, this paper focuses on options for defining highly hazardous pesticides.*" Based on this thought starter the Panel of Experts outlined criteria to identify highly hazardous pesticides (HHP, see Table 1). In addition, the Panel of Experts "recommended that FAO and WHO, as a first step, should prepare a list of HHPs based on the criteria identified, and update it periodically in cooperation with

[1] E.g. the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (http://www.pic.int), the Stockholm Convention on Persistent Organic Pollutants (http://www.pops.int) or the Strategic Approach to International Chemicals Management (http://www.chem.unep.ch/saicm)

[2] The FAO Committee on Agriculture (COAG) conducts periodic reviews and appraisals of agricultural and nutritional problems in order to propose concerted action by Member Nations and the Organization. It also reviews the agriculture and food and nutrition work programmes of the Organization and their implementation, with emphasis on the integration of all social, technical, economic, institutional and structural aspects in promoting agricultural and rural development. Its functions are enumerated in Rule XXXII of the General Rules of the Organization. Membership must be renewed formally each biennium.

[3] This document is available at: http://www.fao.org/unfao/bodies/coag/coag20/index_en.htm

UNEP. It further requested that such a list should be made widely known to all stakeholders involved in pesticide regulation and management."[4]

PAN strongly welcomes these decisions made by the FAO Council, the COAG and the FAO/WHO Panel of Experts on Pesticide Management. PAN is of the opinion however, that the list of indicators accomplished by Panel of Experts has some important shortcomings; in particular pesticides with endocrine disrupting potencies, eco-toxicological properties, or inhalative toxicity have not been taken into account.

Because of these shortcomings, PAN International decided to independently develop a definition of "Highly Hazardous Pesticides" with a more comprehensive set of indicators and to achieve a list of HHP based on the PAN list of indicators.

This publication describes how PAN defines HHP by identifying the indicators. An explanation of the indicators is followed by a list of HHP on the basis of the indicators.

It is important to note that also the list of HHP presented in this publication is *still not complete*. There are several reasons for the limitations in completeness:

- A major reason is that the indicators used for the PAN definition of HHP are based on widely accepted classifications. Due to the time needed for achieving consented classifications these classifications do have shortcomings as explained in the text below.
- Correspondingly, there are "emerged priorities" e.g. pesticides with endocrine disrupting properties. Such properties are not sufficiently operationalised for pesticides as yet.
- Measures to identify substances of high environmental concern have been restricted to the application of consented criteria indicating ubiquitous environmental occurrence and hazardous properties for one ecosystem service. This means that internationally consented criteria on ecological risks e.g. for aquatic or terrestrial species have not been considered.
- In addition, pesticides that may be shown to be linked with a high incidence of severe or irreversible adverse effects on human health or the environment are not identified yet. On the basis of ongoing community monitoring, PAN will identify and list such highly hazardous pesticides in the near future.
- Experiences in the past show that pesticides being classified as "moderately hazardous" by the World Health Organisation give reason for concern even though they are not classified as "highly hazardous". Examples are endosulfan and paraquat, pesticides that caused hundreds of poisonings, or pyrethrins which just recently became known to cause various incidences in the US. For systematic reasons and with view on prioritisation PAN has not added WHO II to the list of indicators. This is all the more reason to immediately improve the documentation of pesticide poisonings in order to identify the highly hazardous pesticides being classified by WHO in Class II as "moderately hazardous".

For the FAO initiative supported by the FAO Council, the COAG, the FAO/WHO Panel of Experts for Pesticide Management and others, there needs to be clarification of when the progressive ban of highly hazardous pesticides (HHP) should happen, and who should make it happen. These are questions not being dealt with in this publication.

Activities to implement the progressive ban of HHP need to be developed in the global regions, on national and local level, by governments, standard setting organisations, in the food sector by companies and associations, the pesticide industry, workers unions, NGOs/CSO etc. This is especially important as there are currently no legal instruments available to achieve a structured and clearly targeted global progressive ban of HHP other

[4] The minutes of the panel of experts meeting October 2007 are available at: http://www.fao.org/ag/agp/agpp/pesticid/Code/Reports.htm

than the Stockholm convention for Persistent Organic Pollutants which focuses only on a very small group of HHPs.

This PAN list of HHP provides a basis for action to implement the progressive ban of highly hazardous pesticides. PAN would like to encourage individuals, institutions, organizations and companies to develop a plan of action with priorities, timeframes and concrete measures. PAN itself will support such initiatives wherever possible.

Carina Weber / PAN Germany for PAN International
Hamburg, January 2009

PAN International Indicators for Identifying 'Highly Hazardous Pesticides'

A pesticide is considered to be highly hazardous by PAN if it has one of the following characteristics,

- high acute toxicity (including inhalative toxicity) and/or,
- long-term toxic effects at chronic exposure (carcinogenicity, mutagenicity, reproductive toxicity, endocrine disruption) and/or,
- high environmental concern either through ubiquitous exposure, bioaccumulation or toxicity, and/or
- known to cause a high incidence of severe or irreversible adverse effects on human health or the environment

In order to obtain an initial PAN International List of Highly Hazardous Pesticides, the criteria, classifications and sources shown in table 1 were utilised.

Table 1: Characteristics of 'Highly Hazardous Pesticides' and sources used to identify HHP pesticides

Criteria	Measure
High acute toxicity	'**Extremely hazardous**' (Class Ia) or '**highly hazardous**' (Class Ib) according to WHO Recommended Classification of Pesticides by Hazard **'Very toxic by inhalation'** (R26) according to EU Directive 67/548 [5]
Long term toxic effect at chronic exposure	'**Human carcinogen**' according to IARC, US EPA **'Known to be carcinogenic to humans'** according to EU Directive 67/548 (Category 1) '**Probable/likely human carcinogen'** according to IARC, US EPA **Sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer** (Category 2) according to EU Directive 67/548 **'Possible human carcinogen/ 'Suggestive evidence of carcinogenic potential'** according to IARC, US EPA '**Substances which cause concern for humans owing to possible carcinogenic effects'** (Category 3) according to EU Directive 67/548
	'**Substances known to be mutagenic to man'** (Category 1) according to EU Directive 67/548
	'**Substances which should be regarded as if they are mutagenic to man'** (Category 2) according to EU Directive 67/548
	'Substances known to impair fertility in humans' (Category 1) according to EU Directive 67/548 **'Substances which should be regarded as if they impair fertility in humans' and/or 'Substances which should be regarded as if they cause developmental toxicity to humans'** (Category 2) according to EU Directive 67/548
	Endocrine disruptor or potential endocrine disruptor according to EU Category 1 and Category 2
	Categories 1A and 1B of the GHS for carcinogenicity, mutagenicity, and

[5] The classification in this Directive is the equivalent to the GHS classification for inhalative toxicity. It has been updated several times, the proposal of the 30st Adaptation to the Technical Progress (ATP) is used for the PAN List of HHP.

	reproductive toxicity will be used for the PAN HHP list as soon as it is available
High environmental concern	**Stockholm Convention: Pesticides listed in Annex A & B**
	Ozone depleting according to the Montreal Protocol
	'Very bioaccumulative' according to REACh criteria as listed by FOOTPRINT (BCF >5000)
	'Very persistent' according to REACh criteria as listed by FOOTPINT (half-life > 60 d in marine- or freshwater or half-life > 180 d in marine or freshwater sediment)
	Hazard to ecosystem services – 'Highly toxic for bees' according to U.S. EPA as listed by FOOTPRINT data (bee toxicity: LD50, µg/bee < 2)
Known to cause a high incidence of severe or irreversible adverse effects	**Rotterdam Convention: Pesticides listed in Annex III**
	Incidences to be documented

Explanatory notes and comments regarding the classification systems, lists and indicators being used by PAN to identify Highly Hazardous Pesticides

The Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

The aim of the GHS is a global harmonization of the classification and labeling of chemicals. The Plan of Implementation of the World Summit on Sustainable Development (WSSD), adopted in Johannesburg in 2002, encourages countries to implement the GHS as soon as possible with a view to having the system fully operational by 2008. However, it has not been fully implemented yet. Therefore the GHS classification has not been used by PAN to develop the PAN International List of HHP, but will be used in the future.

The WHO Recommended Classification of Pesticides by Hazard

The latest revision of the WHO Recommended Classification of Pesticides by Hazards was conducted in 2004 and contains about 870 pesticides. PAN included those pesticides listed in WHO Class Ia and Ib into the PAN HHP list.

The most recent version of the WHO classification must be considered incomplete for the following reasons:
- Since the last revision a large number of new active ingredients entered for example the European market, but their hazards have not been classified by WHO.
- Additionally LD_{50} values for inhalative toxicity are not included in the WHO classification. This is a major deficiency because users of pesticides are often exposed via inhalation.
- Also endocrine disruption is not included in the WHO classification.
- And formulations are not included in the classification. The acute toxicity of formulations and mixtures can be calculated based on the percentage and the LD_{50} values of the active ingredients in the formulation or mixture. However, so-called 'inert' ingredients[6] are neglected in this calculation although they may have an influence on the toxicity of the formulation or the mixture.

Source used:

WHO (2005): The WHO recommended classification of pesticides by hazard and guidelines to classification 2004, International Program on Chemical Safety (IPCS) & World Health Organization (WHO), Geneva)

Council Directive 67/548/EC

The Globally Harmonized System (GHS) is based on the EU classification system. The combination of danger symbols for acute hazards with descriptive risk phrases for acute as well as sub-chronic and chronic toxicity, plus the categories for mutagenic, carcinogenic and reproductive effects, presents a fairly comprehensive instrument for the evaluation of chemicals.

[6] "Inert" ingredient: substances which can enhance the efficiency of the active substance, make a product more degradable or easier to use. 'Inerts' are mostly handled as trade secrets of the manufacturer, which means they are not labelled on the product and therefore not included in the calculation. (More information see footnote 22.)

The major legislative framework in force dealing with dangerous substances in the European Union is the Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances. For the PAN HHP list the final proposal for the 30th amendment[7] was used to identify pesticides which are very toxic by inhalation as well as pesticides considered carcinogenic, mutagenic and/or toxic to reproduction.

Sources used:

EC (1967): Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. Official Journal of the European Community No. 196. Brussels

ECB (2007): Final proposal of the Technical Committee on Classification and Labelling of Dangerous Substances for the 30th Adaptation to Technical Progress of Directive 67/548/EEC. European Chemical Bureau (ECB) http://ecb.jrc.ec.europa.eu/classification-labelling

REACh

ReACh, the 'Registration, Evaluation, Authorisation and Restriction of Chemicals (REACh)' is a European Union Regulation (EC/2006/1907 of 18 December 2006). It addresses the production and use of chemical substances, and their potential impacts on both human health and the environment. REACH applies to all chemicals imported or produced in the EU.

The Technical Guidance Document (TGA)[8] on risk assessment defines the criteria for persistence and bioaccumulation, which are used for the PAN list of HHP.

According to REACh chemicals are "very bioaccumulative" if their Bio-Concentration Factor (BCF) is larger than 5,000 and "very persistent" if their half-life in marine water or fresh water exceeds 60 days or their half-life in marine or freshwater sediment exceeds 180 days.

Source used:

ECB (2003): Technical Guidance Document on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. Part II. Institute for Health and Consumer Protection. European Chemicals Bureau (ECB)

International Agency for Research on Cancer (IARC)

The International Agency for Research on Cancer (IARC) is part of the World Health Organisation (WHO). The goal of IARC is to evaluate, with the assistance of international working groups of experts, critical reviews and evaluations of evidence of carcinogenicity and to publish them in monographs. This series of monographs started in 1972 and since then, almost 900 agents have been reviewed. Participants in the working groups are individual scientists who do not represent organisations, industry or governments.

[7] Final proposal of the Technical Committee on Classification and Labelling of Dangerous Substances for the 30th Adaptation to Technical Progress of Directive 67/548/EEC, http://ecb.jrc.ec.europa.eu/classification-labelling/

[8] ECB (2003): Technical Guidance Document on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. Part II. Institute for Health and Consumer Protection. European Chemicals Bureau (ECB)

All pesticides which are classified as ‘carcinogenic to humans’ (Group 1), ‘probably carcinogenic to humans’ (Group 2A) or ‘possibly carcinogenic to humans’ (Group 2B) have been included in the PAN List of HHP.

Source used:

IARC (2006): Agents reviews by the IARC Monographs, Volumes 1-95 (by CAS Numbers), International Agency for Research on Cancer (IARC), Lion, France. Website: http://monographs.iarc.fr/index.php

U.S. Environmental Protection Agency (U.S. EPA)

Cancer Classification

The U.S. EPA Office of Pesticide Programs maintains a List of Chemicals Evaluated for Carcinogenic Potential.[9] This list is a product of the general risk assessment included in the process of pesticide registration. This classification can be seen as a further development of the IARC classification system, but also includes the potential exposure of humans.[10] Therefore, a low exposure potential can place a pesticide in a lower category even when sufficient evidence of carcinogenicity exists. U.S. EPA's classification of carcinogenicity has changed several times over the last 20 years. The list is updated annually, but its focus is mostly on pesticides registered in the USA.

Source used:

US EPA (2007): Chemicals Evaluated for Carcinogenic Potential, April 26, 2006, Science Information Management Branch, Health Effects Division, Office of Pesticide Programs U.S. Environmental Protection Agency (US EPA), Washington DC, USA

Classification for bee toxicity

The US EPA also defines categories for environmental toxicity of pesticides[11]. US EPA defines a pesticide highly toxic to bees if the LD 50 is lower that 2 microgramm/bee (µg/bee). Pesticides highly toxic to bees are included in the PAN List of HHP.

Source used:

US EPA (2007b): Technical Overview of Ecological Risk Assessment Analysis Phase: Ecological Effects Characterization, U.S. Environmental Protection Agency, Washington, DC Website: www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm

EU categorization of endocrine disruptors

The issue of endocrine disrupting pesticides gained widespread public, political and scientific attention at the beginning of the 1990s. Today there are still no confirmed lists of pesticides with endocrine disrupting properties on any official national or international level (e.g. EU, WHO). However, the EU has developed a priority list of pesticides with evidence for endocrine disrupting properties.

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[9] US Environmental Protection Agency Office of Pesticide Programmes (2000): List of Chemicals Evaluated for Carcinogenic Potential, U.S. EPA Office of Pesticide Programmes, Washington, DC, USA

[10] Altenburger, R., Bödeker, W., Brückmann, S., Oetken, G., Weber, C. (1999): Zur Human- und Ökotoxizität von Pestiziden, die im Bananenanbau verwendet werden, Pestizid Aktions-Netzwerk e.V. (PAN Germany), Hamburg, Germany

[11] US EPA (2007): Technical Overview of Ecological Risk Assessment Analysis Phase: Ecological Effects Characterization, U.S. Environmental Protection Agency, Washington, DC www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm

In the PAN list of HHP all EU Category 1 pesticides (at least one study providing evidence of endocrine disruption in an intact organism) and Category 2 pesticides (in vitro evidence of endocrine disruption) are included.

Sources used:

EC (2000): Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption - preparation of a candidate list of substances as a basis for priority setting, European Commission, Delft

EC (2004): Commission Staff Working Document SEC (2004) 1372 on implementation of the Community Strategy for Endocrine Disrupters - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706), European Commission, Brussels

EC (2007): Commission staff working document on the implementation of the "Community Strategy for Endocrine Disrupters" - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706), (COM (2001) 262) and (SEC (2004) 1372). SEC(2007) 1635. European Commission (EC).Brussels, 30.11.2007

International Conventions & Treaties on chemicals of high concern

The **Stockholm Convention** aims at the elimination of Persistent Organic Pollutants (POPs), some of the most unwanted chemicals in the world. POPs are toxic, bioaccumulative, highly persistent and pose a global threat to living beings. All pesticides formally adopted under these criteria to the Stockholm Convention are on the PAN HHP list.

The **Rotterdam Convention** on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade regulates the exchange of information in international trade in certain hazardous pesticides (active ingredients and formulations). All pesticides formally adopted under the Rotterdam Convention are on the PAN list of HHP.

The **Montreal Protocol** on Substances that Deplete the Ozone Layer is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. Currently, there is one pesticide listed as ozone depleting chemical. This pesticide (methyl bromide) is on the PAN list of HHP.

Sources used:

Website of the Stockholm Convention at http://www.pops.int

Website of the Rotterdam Convention at http://www.pic.int

Website of Montreal Protocol at http://ozone.unep.org/

Ecosystem services – pollination by bees

The U.S. EPA Office of Pesticide Programs after reviewing individual toxicity or ecological effect studies for a pesticide summarizes the toxicity to certain species groups. In developing its ecological effect characterization, EPA uses a three-step scale of toxicity categories to classify pesticides based on bee toxicity data. All pesticides classified as ‘highly toxic to bees’ have been included to the HHP list by PAN.

Source used:

FOOTPRINT (2007): The FOOTPRINT Pesticide Properties DataBase. Database collated by the University of Hertfordshire as part of the EU-funded FOOTPRINT project (FP6-SSP-022704) (http://www.eu-footprint.org).

Method applied to identify highly hazardous pesticides

The classification systems and lists mentioned above have been integrated in a pesticide database. In this database the criteria for defining highly hazardous pesticides were searched. Pesticides which are considered to be 'obsolete' by the WHO/IPCS were omitted from the search, if they are not targeted by any of the international conventions (PIC/ POP).

The FOOTPRINT Pesticide Properties Database has been used to identify pesticides with the characteristics of being persistent, bioaccumulative and/or toxic to bees (LD50 <2 microgram/bee).

Pesticides listed by PAN International as Highly Hazardous

1,2,4-triazole
1,3-dichloropropene
2,4,5-T
2,4,5-T, butyric acid
2,4,5-trichlorophenol
2,4,6-trichlorophenol
2,4-D
2,4-DB
2,4-dichlorophenol
2,4-DP, isooctyl ester
2,6-Dichlorbenzamid
2-Mercaptobenzothiazole
3-CPA
Abamectin
Acephate
Acetochlor
Acifluorfen, sodium salt
Acrinathrin
Acrolein
Alachlor
Aldicarb
Aldrin
Allethrin
alpha-BHC
Alpha-chlorohydrin
Aluminum phosphide
Aminopyralid
Amitraz
Amitrole
Aniline
anthracene oil
Arsenic acid
Arsenic pentoxide
Asulam
Atrazine
Azafenidin
Azamethiphos
Azinphos-ethyl
Azinphos-methyl
Azobenzene
Azocyclotin
Azoxystrobin
Bacillus subtilis GBO3
Bendiocarb
Benfluralin
Benomyl
Bentazone
Benthiavalicarb-isopropyl
Beta-cyfluthrin
Bifenthrin
Binapacryl
Bis(chloroethyl) ether
Boscalid
Brodifacoum
Bromacil
Bromadiolone
Bromethalin
Bromoxynil
Bromuconazole
Buprofezin
Butachlor
Butocarboxim
Butoxycarboxim
Cacodylic acid
Cadusafos
Captafol
Captan
Carbaryl
Carbendazim
Carbofuran
Chinomethionat
Chlordane
Chlordimeform hydrochloride
Chlorethoxyphos
Chlorfenapyr
Chlorfenvinphos
Chlormephos
Chlorobenzilate
Chloroform
Chlorophacinone
Chloropicrin
Chlorothalonil
Chlorotoluron
Chlorpyrifos
Chlorpyrifos-methyl
Chlorsulfuron
Chlorthal-dimethyl
Chlozolinate
Cholecalciferol
Cinidon-ethyl
Clodinafop-propargyl
Clofencet
Clofentezine
Clothianidin
Coconut diethanolamide
Coumaphos
Coumatetralyl
Creosote
Cumyluron
Cyanamide
Cyanazine
Cyfluthrin
Cyhexatin
Cypermethrin
Cypermethrin, alpha
Cyproconazole
Cyromazine
Daminozide
DDT
Deltamethrin
Demeton-S-methyl
Diazinon
Dichlobenil
Dichloro acetic acid
Dichlorophene
Dichlorprop-P
Dichlorvos
Diclofop-methyl
Dicofol
Dicrotophos
Dieldrin
Difenacoum
Difenoconazole
Difethialone
Dimethenamid
Dimethipin
Dimethoate
Dimethoxane
Dinocap
Dinoseb
Dinoterb
Diphacinone
Diquat dibromide
Disulfoton
Diuron
DNOC
DNOC ammonium salt
DNOC potassium salt
DNOC, sodium salt
Doxorubicin
Edifenphos
Endosulfan
Endrin
Epichlorohydrin
EPN
Epoxiconazole
Esbiothrin
Esfenvalerate
Ethalfluralin
Ethiofencarb
Ethiozin
Ethofumesate
Ethoprophos
Ethylene dibromide
Ethylene dichloride
Ethylene oxide
Ethylene thiourea
Etofenprox
Famphur
Fenamiphos
Fenarimol
Fenazaquin
Fenbuconazole
Fenbutatin-oxide
Fenitrothion
Fenoxycarb
Fenpropathrin
Fenthion
Fentin acetate
Fentin hydroxide
Fenvalerate
Fipronil
Flocoumafen
Flonicamid
Fluazifop-butyl
Fluazinam
Flucythrinate
Fludioxonil
Flumioxazin
Fluometuron
Fluopicolide
Fluoroacetamide
Flusilazole
Fluthiacet-methyl
Flutolanil
Folpet
Forchlorfenuron
Formaldehyde
Formetanate
Fosthiazate
Furathiocarb
Furfural
Furilazole
Glyphosate trimesium
Haloxyfop-methyl
(unstated stereochemistry)
Heptachlor
Heptachlor epoxide
Heptenophos
Hexachlorobenzene
Hexachloroethane
Hexaconazole
Hexaflumuron
Hexchlorocyclohexane
Hexythiazox
Hydramethylnon
Hydrazine
Imazalil
Imazaquin
Imazethapyr
Imidacloprid
Indoxacarb
Iodomethane
Ioxynil
Iprodione
Iprovalicarb

Isophorone
Isoproturon
Isoxaben
Isoxaflutole
Isoxathion
Ketoconazole
Kresoxim-methyl
Lactofen
Lambda-cyhalothrin
Lindane
Linuron
Lufenuron
Malathion
Mancozeb
Maneb
MCPA
MCPB
MCPP
Mecarbam
Mecoprop-P
Mepanipyrim
Mepronil
Mercuric chloride
Mercuric oxide
Mercury
Merpafol cis isomer
Meta-cresol
Metaldehyde
Metam sodium, dihydrate
Metam-sodium
Metconazole
Methabenzthiazuron
Methamidophos
Methidathion
Methiocarb
Methomyl
Methoxychlor
Methyl bromide
Methyl isothiocyanate
Methylene chloride
Metiram
Metolachlor
Metrafenone
Metribuzin
Metronidazole
Mevinphos
Mevinphos (stereochemistry unspecified)
MGK 326
Mirex
Molinate
MON 4660
Monocrotophos
MSMA
Myclobutanil
Nicotine
Nitrapyrin
Nonylphenol
Norflurazon
Omethoate
Orthosulfamuron
Oryzalin
Oxadiazon
Oxadixyl
Oxamyl
Oxydemeton-methyl
Oxyfluorfen
Paclobutrazol
Para-dichlorobenzene
Paraquat dichloride
Parathion
Parathion-methyl
P-chloroaniline
PCP
Pendimethalin
Penoxsulam
Permethrin
Phenothrin
Phenthoate
Phorate
Phosmet
Phosphamidon
Phosphine
Picloram
Picloram, diethanolamine salt
Piperonyl butoxid
Pirimicarb
Potasan
Metam-potassium
Polyhexamethylene biguanidine
Prochloraz
Procymidone
Prodiamine
Profoxydim
Prometryn
Propachlor
Propanil
Propargite
Propazine
Propetamphos
Propiconazole
Propoxur
Propylene oxide
Propyzamide
Prosulfocarb
Pymetrozine
Pyraflufen-ethyl
Pyrasulfotole
Pyrazoxon
Pyrethrin I
Pyrimethanil
Pyrithiobac-sodium
Quinalphos
Quinoclamine
Quinoxyfen
Quintozene
Quizalofop-p-tefuryl
Resmethrin
S,S,S-tributyl phosphorotrithioate
S-Bioallethrin
Silthiofam
Simazine
S-Metolachlor
Sodium arsenate
Sodium dimethyl dithio carbamate
Sodium fluoroacetate (1080)
Spinosad
Spirodiclofen
Strychnine
Sulfosulfuron
Sulfotep
TCMTB
Tebuconazole
Tebufenpyrad
Tebupirimifos
Tefluthrin
Tembotrione
Tepraloxydim
Terbufos
Terbutryn
Terrazole
Tetrachlorvinphos
Tetraconazole
Tetramethrin
Thiabendazole
Thiacloprid
Thiamethoxam
Thiazopyr
Thiodicarb
Thiofanox
Thiometon
Thiophanate-methyl
Thiourea
Thiram
Tolylfluanid
Topramezone
Toxaphene
Tralkoxydim
Triadimefon
Triadimenol
Tri-allate
Triasulfuron
Triazophos
Tribenuron methyl
Trichlorfon
Trichlorophenol
Triclosan
Tricyclazole
Tridemorph
Trifluralin
Triflusulfuron-methyl
Triforine
Triticonazole
Uniconazole
Vamidothion
Vinclozolin
Warfarin
zeta-Cypermethrin
Zineb
Ziram
Z-Phosphamidon