

Toxicity Information for 2-hydroxy-4-n-octyl benzophenone

[toptop](#)

Note: Information for many chemicals is incomplete and may not be fully representative of effects on humans. [Why?](#)

Summary Toxicity Information

<u>PAN Bad</u> <u>Actor</u> <u>Chemical</u> <u>1</u>	<u>Acute</u> <u>Toxicity</u> ²	<u>Carcinog</u> <u>en</u>	<u>Cholinest</u> <u>erase</u> <u>Inhibitor</u>	<u>Ground</u> <u>Water</u> <u>Contaminant</u>	<u>Developmental</u> <u>or</u> <u>Reproductive</u> <u>Toxin</u>	<u>Endocri</u> <u>ne</u> <u>Disrupt</u> <u>or</u>
Not Listed			No			

Indicates high toxicity in the given toxicological category.

Indicates no available [weight-of-the-evidence](#) summary assessment. For additional information on toxicity from scientific journals or registration documents, see the "Additional Resources for Toxicity " section of the [chemical detail page](#).

1. [PAN Bad Actors](#) are chemicals that are one or more of the following: highly acutely toxic, cholinesterase inhibitor, known/probable carcinogen, known groundwater pollutant or known reproductive or developmental toxicant. NOTE! Because there are no authoritative lists of Endocrine Disrupting (ED) chemicals, EDs are not yet considered PAN Bad Actor chemicals.
2. The acute toxicity reported on this page is of the pure chemical ingredient only and may not reflect the acute toxicity of individual pesticide products. To view acute toxicity of individual products, click on 'View Products' link in the '[Chemical Identification](#)' section above.

Additional Resources about the Toxicity of this Chemical

See the [Global Pesticide Resources](#) page for many additional links.

Detailed Toxicity Information

Acute Toxicity ²

WHO Acute Hazard	Not Listed
TRI Acute Hazard	Not Listed
Material Safety Data Sheets	Not Available
Acute rating from U.S. EPA product label	No Consensus Value No NTP Studies
U.S. NTP Acute Toxicity Studies	
View Studies	No
Cholinesterase Inhibitor	

2. The acute toxicity reported on this page is of the pure chemical ingredient only and may not reflect the acute toxicity of individual pesticide products. To view acute toxicity of individual products, click on 'View Products' link in the ['Chemical Identification'](#) section above.

Cancer Information		
IARC Carcinogens	Not Listed	
U.S. NTP Carcinogens	Not Listed	
California Prop 65 Known Carcinogens	Not Listed	
U.S. EPA Carcinogens	Not Listed	
TRI Carcinogen		
Endocrine Disruption		
Illinois EPA list	Not Listed	
Keith list	Not Listed	
Colborn list	Not Listed	
Benbrook list	Not Listed	
EU list		
Reproductive and Developmental Toxicity		
CA Prop 65 Developmental Toxin	Not Listed	
U.S. TRI Developmental Toxin	Not Listed	
CA Prop 65 Female Reproductive Toxin	Not Listed	
U.S. TRI Reproductive Toxin		
Chemicals of Special Concern		
PAN Bad Actors	Not Listed	
PAN Dirty Dozen list	Not Listed	

Water Pollution Potential and Criteria for 2-hydroxy-4-n-octyl benzophenone

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Water Pollution Potential

[PAN Ground Water Contaminant Rating](#)

Insufficient Data

Sorry, no water quality standards or criteria have been established for this chemical by the U.S. or Canadian governments; however, there may be criteria established for [related chemicals](#).

Regulatory Information for 2-hydroxy-4-n-octyl benzophenone

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International Regulatory Status

[Worldwide Registration](#)

Click on link at right to view registration information for different countries -->

[Worldwide Registration for: 2-hydroxy-4-n-octyl benzophenone](#)

Number of countries where this chemical is:

Banned, Restricted or

Cancelled: 0

Not legal for import: 0

[UNEP Persistent Organic Pollutant \(POP\)](#)

Not Listed

[UNEP Prior Informed Consent Chemical \(PIC\)](#)

Not Listed

[WHO Obsolete Pesticide](#)

Not Listed

U.S. and California Regulatory Status

U.S. EPA Registered	No
U.S. EPA Hazardous Air Pollutant	Not Listed
U.S. EPA Minimum Risk Pesticide (25b list)	No
CA Registered	Not Listed
CA Groundwater Contaminant	Not Listed
CA Toxic Air Contaminant	

Maximum Tolerance and Residue Levels

Codex Alimentarius (UN FAO Maximum Residue Limits)	Go to web site
U.S. Maximum Tolerance Levels	Go to web site
European Union Maximum Residue Levels	Go to web site

Ecotoxicity for 2-hydroxy-4-n-octyl benzophenone

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Note! Information for many chemicals is incomplete and may not be fully representative of effects on the environment. [Why?](#) Click on underlined terms for definitions and additional information.

Aquatic Ecotoxicity

All Toxic Effects for Organism Group	
Organism Group	Effects Noted
Sorry, no ecotoxicity data available for this chemical. Try related chemicals .	

Summary of Acute Toxicity for Organism Group

Sorry, no acute ecotoxicity data available for this chemical. Try [related chemicals](#).

Terrestrial Ecotoxicity

We are seeking funding to incorporate terrestrial ecotoxicity data analogous to the aquatic ecotoxicity data in the space above. Watch this space!

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Related Chemicals for 2-hydroxy-4-n-octyl benzophenone

CAS Number	Relation	Reason	Chemical Name	Chem Detail	Registration	Symptoms	California Use	Chem Use Type	U.S. EPA Reg	PAN Back
	Parent	P	2-hydroxy-4-n-octyl benzophenone	View	View	View	View		No	Not Listed

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Working with the Information on this Page

Click on underlined terms for definitions or go to the [Pesticide Tutorial](#) overview page.

Any underlined term with a book icon has additional information.

* Data marked with an asterisk indicates that this chemical is not explicitly listed on the corresponding list. Instead, it belongs to a group of chemicals that IS designated on the list. For example, if an agency assigns a classification of reproductive toxicant to "mercury compounds", that classification is applied to all mercury compounds in the PAN Pesticide database, which are then marked with an asterisk.

Chemicals of special concern

[PAN Dirty Dozen Pesticides](#)

[PAN Bad Actor Pesticides](#)

Pesticide Action Network (PAN) Dirty Dozen Pesticides

[PAN International](#) launched its Dirty Dozen Campaign in 1985 to target a list of extremely hazardous pesticides for bans or strict controls on production and use worldwide, and to advocate their replacement with safe and sustainable pest control methods.

Collectively, Dirty Dozen pesticides cause many deaths and widespread environmental damage every year. Most have been banned or restricted in the industrialized countries because of their known hazards. Yet the Dirty Dozen are still heavily promoted and widely

used in many developing nations, where the lack of protective equipment, safety training, and medical services makes their impact even more devastating.

The Dirty Dozen includes: aldicarb, toxaphene, chlordane and heptachlor, chlordimeform, chlorobenzilate, DBCP, DDT, the "drins" (aldrin, dieldrin and endrin), EDB, HCH and lindane, paraquat, parathion and methyl parathion, pentachlorophenol, and 2,4,5-T. Most of these pesticides qualify as persistent organic pollutants (POPs), which are notable in their longevity, toxicity to humans and animals, and their ability to be transported around the globe through the atmosphere.

The United Nations Environment Programme (UNEP) has identified a number of the Dirty Dozen chemicals as the initial targets for global elimination under an international treaty signed in May 2001 (1, 2). Nine of these chemicals are organochlorine pesticides (aldrin, endrin, dieldrin, DDT, chlordane, heptachlor, hexachlorobenzene, toxaphene and mirex). The industrial chemicals dioxin, furans and PCBs are also on the POPs treaty list. The treaty, which will come into force when ratified by 50 countries, will have provisions to add additional chemicals which meet the agreed-upon criteria for persistence in the environment, bioaccumulation, and transportability. There is widespread agreement that some of the remaining Dirty Dozen pesticides which are still in use in the United States and other industrialized countries (e.g., lindane and endosulfan) meet these criteria. Other, less persistent but still highly toxic Dirty Dozen chemicals like methyl parathion, pentachlorophenol, paraquat, and 2,4,5-T remain in use in the U.S. or other countries.

References:

Articles from PAN related to the Dirty Dozen can be found by searching for "Dirty Dozen" at the [PANNA Web site](#).

1. *Persistent Organic Pollutants*, [United Nations Environment Programme](#). Viewed on October 31, 2002.
2. [International POPs Elimination Network](#) Web site. Viewed on October 31, 2002.

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Pesticide Action Network (PAN) Bad Actor Pesticides

In order to identify a "most toxic" set of pesticides, [Pesticide Action Network](#) (PAN) and [Californians for Pesticide Reform](#) (CPR) created the term PAN Bad Actor pesticides. These pesticides are at least one of the following:

- Known or probable [carcinogens](#), as designated by the International Agency for Research on Cancer (IARC), U.S. EPA, U.S. National Toxicology Program, and the state of California's Proposition 65 list.
- [Reproductive or developmental toxicants](#), as designated by the state of California's Proposition 65 list.
- Neurotoxic [cholinesterase inhibitors](#), as designated by California Department of Pesticide Regulation, the Materials Safety Data Sheet for the particular chemical, or PAN staff evaluation of chemical structure (for organophosphorus compounds).

- [Known groundwater contaminants](#), as designated by the state of California (for actively registered pesticides) or from historic groundwater monitoring records (for banned pesticides).
- Pesticides with [high acute toxicity](#), as designated by the World Health Organization (WHO), the U.S. EPA, or the U.S. National Toxicology Program.

In 2000, PAN and CPR published [Hooked on Poison: Pesticide Use in California 1991-1998](#), a report on trends in pesticide use in California with a particular focus on Bad Actor pesticides used in California.

About the Data: Accuracy, currency, comprehensiveness and source

Data for PAN Bad Actors come from official lists of chemicals with certain toxicity properties. The available lists are generally accurate and up-to-date. However, because many chemicals have not yet been thoroughly evaluated, these lists cannot be considered comprehensive. New chemicals will be added as they are listed in the official source lists.

References:

See individual toxicant categories (acute toxins, carcinogens, etc.) for data sources.

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Acute toxicity

Acute toxicity refers to the immediate effects (0-7 days) of exposure to a pesticide. Highly acutely toxic pesticides can be lethal at very low doses. Narrative toxicity categories (Danger, Warning, Caution) are based on the LD₅₀, the dose (in milligrams of substance per kilogram of body weight) that kills 50% of the test animals in a standard assay, through either oral or dermal exposure routes. For inhalation exposures, the LC₅₀ is used--the concentration in air in mg per liter that kills 50% of the test animals. The U.S. EPA gives a narrative warning label to pesticide products based on LD₅₀s. See [table](#) for LD₅₀ narrative

equivalents.

[PAN Acute Toxicity Description](#)

[WHO Acute Hazard Rankings](#)

[U.S. EPA Acute Toxicity Rankings](#)

[U.S. EPA Toxics Release Inventory Rankings](#)

[U.S. NTP Acute Toxicity Rankings](#)

[Study Type](#)[Acute](#)

[Exposure Route](#)

[Species](#)

[Result](#)

[Units](#)
[Acute Toxicity Rating](#)
[Used for Summary Rating](#)

Pesticide Action Network (PAN) Acute Toxicity Description

There are several organizations that evaluate and rank chemicals for their acute toxicity. *Active ingredients* of pesticides are ranked by the [World Health Organization](#) (WHO). Information on LD₅₀s (which can be equated to a narrative ranking) can be obtained from the U.S. [National Toxicology Program](#) (NTP), U.S. EPA's [Toxics Release Inventory](#) (TRI) ranking, or materials safety data sheets (MSDS). *Formulated pesticide products* (which often include inert ingredients) are given a toxicity rating by the U.S. EPA which is shown as a [warning label](#) on the pesticide product.

Because toxicity designations from different sources sometimes conflict with each other, PAN created a summary acute toxicity designation that reflects the most toxic ranking assigned by any organization. In addition, the different terms used by different organizations to describe acute toxicity were translated into a consistent set of terms. For example, if WHO determined a pesticide to be "Highly Hazardous", we used the label "Highly Toxic." The equivalences between the different ranking systems are shown in the table below. For a chemical to be classified as a [PAN Bad Actor](#), it must be in either the **Extremely Toxic** or **Highly Toxic** PAN summary category.

PAN category	Equivalence in other ranking systems
Extremely toxic	WHO: Extremely hazardous U.S. EPA: Category I, DANGER U.S. NTP: no parallel category MSDS: no parallel category TRI: no parallel category
Highly toxic	WHO: Highly hazardous U.S. EPA: Category I, DANGER U.S. NTP: based on U.S. EPA's LD ₅₀ guidelines MSDS: based on U.S. EPA's LD ₅₀ guidelines TRI: Yes
Moderately toxic	WHO: Moderately hazardous U.S. EPA: Category II, WARNING U.S. NTP: based on U.S. EPA's LD ₅₀ guidelines MSDS: based on U.S. EPA's LD ₅₀ guidelines TRI: no parallel category
Slightly toxic	WHO: Slightly hazardous U.S. EPA: Category III, CAUTION

	U.S. NTP: based on U.S. EPA's LD ₅₀ guidelines MSDS: based on U.S. EPA's LD ₅₀ guidelines TRI: no parallel category
Not acutely toxic	WHO: Unlikely to be hazardous U.S. EPA: Category IV, CAUTION U.S. NTP: based on U.S. EPA's LD ₅₀ guidelines MSDS: based on U.S. EPA's LD ₅₀ guidelines TRI: no parallel category

World Health Organization (WHO) Acute Hazard Rankings

The WHO bases its ratings on the lowest published rat oral LD₅₀, the lethal dose (in milligrams of substance per kilogram of body weight) that kills 50% of the test animals in a standard assay. WHO gives a hazard ranking of Ia (Extremely Hazardous) to the most hazardous pesticide active ingredients. While the WHO ratings generally reflect acute toxicity, they also take into account other toxic effects such as reproductive and developmental toxicity. WHO does not evaluate the fumigants, a class of gaseous pesticides that are generally extremely hazardous, nor does it evaluate pesticides believed obsolete or discontinued, even though some of these "obsolete" pesticides are currently registered for use in the U.S.

WHO Toxicity Classification		Rat LD ₅₀ (mg of chemical per kg of body weight)			
		Solids (oral)	Liquids (oral)	Solids (dermal)	Liquids (dermal)
Ia	Extremely hazardous	< 5	< 20	< 10	< 40
Ib	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	200-2,000	100-1,000	400-4,000
III	Slightly hazardous	> 500	>2,000	>1000	> 4,000
Table 5	Unlikely to present acute hazard in normal use	> 2,000	> 3,000	---	---
Table 6	Not classified: believed obsolete				
Table 7	Fumigants not classified by WHO				

About the Data: Accuracy, currency, comprehensiveness and source

This dataset was compiled by WHO and includes acute toxicity ratings for 575 pesticide chemicals. Not included in the WHO data are gaseous pesticides and any pesticide

1	Highly Toxic	Danger-Poison*	< 50	< 200	< 0.05	-----	-----
1	Highly Toxic	Danger	< 50	< 200	< 0.05	Corrosive (irreversible destruction of ocular tissue) or corneal involvement or irritation persisting for more than 21 days.	Corrosive (tissue destruction into the dermis and/or scarring)
2	Moderately Toxic	Warning	50-500	200-2,000	0.05-0.5	Corneal involvement or irritation clearing in 8-21 days	Severe irritation at 72 hours (severe erythema or edema)
3	Slightly Toxic	Caution	500-5,000	2,000-5,000	0.5-2	Corneal involvement or irritation clearing in 7 days or less	Moderate irritation at 72 hours (moderate erythema)
4	Not Acutely Toxic	None	> 5,000	> 5,000	> 2	Minimal effects clearing in less than 24 hours	Mild or slight irritation (no irritation or slight erythema)

*This signal word is used for acute systemic poisons.

About the Data: Accuracy, currency, comprehensiveness and source

All pesticide products registered for use in the U.S. are required to have an acute toxicity rating on the label. PAN staff obtained U.S. EPA acute toxicity rankings from the labels for single-active-ingredient products containing technical grade active ingredient at more than 90% concentration. Many of these warning labels are not internally consistent, with pesticide products containing essentially the same concentration of active ingredient labeled with several different toxicity ratings. When there was a *consistent* acute toxicity rating for a given active ingredient, we assigned an acute toxicity rating. Where ratings were inconsistent or when acute toxicity was apparently due to an inert ingredient, no rating was assigned. Initial analysis was conducted using U.S. EPA product data from August 2, 2000. Updates are planned on an as-needed basis.

References:

Carcinogenicity

Some pesticides have been evaluated for their ability to cause cancer by the [U.S. EPA](#), [International Agency for Research on Cancer](#) (IARC), [National Institutes of Health](#) (NIH), or the [State of California](#). All of these groups use a [weight-of-the-evidence](#) approach, where a panel of scientists evaluate the available data for a particular chemical. The absence of a chemical on any of these lists does not necessarily mean it is *not* a carcinogen. It may mean that it has not yet been evaluated.

[PAN Summary Carcinogen Categories](#)

[U.S. EPA-OPP Carcinogen List](#)

[U.S. EPA Toxics Release Inventory Carcinogen List](#)

[IARC Carcinogen List](#)

[U.S. NTP Carcinogen List](#)

[State of California Proposition 65 Carcinogen Listref_toxicity2.html - Acute](#)

Pesticide Action Network (PAN) Summary Carcinogen Categories

There are several organizations that evaluate and rank chemicals for their carcinogenicity. Because carcinogenicity designations from different sources sometimes conflict with each other, PAN created a summary carcinogen designation that reflects the *most* toxic ranking assigned by any organization. In addition, the different terms used by different organizations to describe carcinogen status were translated into a consistent set of terms. The equivalences between the different ranking systems are shown in the table below. For a chemical to be classified as a [PAN Bad Actor](#), it must be in either the **Known** or **Probable** PAN summary category.

PAN category	Equivalence in other ranking systems
Known	IARC: Known

	<p>U.S. EPA: Known, Known/Likely, Carcinogenic to humans U.S. NIH: Known</p>
Known, P65 or TRI only	<p>CA Proposition 65: Known to the State of California to be a carcinogen. California's ranking does not distinguish between different carcinogenic potencies, using a Yes/No format. U.S. EPA TRI: Listed as a carcinogen on the Toxics Release Inventory list. This ranking does not distinguish between different carcinogenic potencies, using a Yes/No format.</p> <p>Any pesticide listed as a Prop 65 or TRI carcinogen but NOT as a Known carcinogen by IARC, EPA or U.S. NIH is listed separately as Known, P65 or TRI only.</p>
Probable	<p>IARC: Probable U.S. EPA: Probable (B1 and B2), Likely to be carcinogenic to humans, Likely (high doses)/not likely (low doses) U.S. NIH: Reasonably anticipated to be a human carcinogen CA Proposition 65: No parallel category</p>
Possible	<p>IARC: Possible U.S. EPA: Possible, Suggestive evidence of carcinogenicity CA Proposition 65: No parallel ranking U.S. NIH: No parallel category</p>
Unclassifiable	<p>IARC: Unclassifiable U.S. EPA: Not classifiable as to human carcinogenicity, Unclassifiable, Not classifiable, Not amenable to classification, Can not be determined, Data are inadequate for an assessment of human carcinogenic potential. This ranking also includes chemicals ranked as "Not Classified" and "Deferred." CA Proposition 65: No parallel category U.S. NIH: No parallel category</p>
Not Likely	<p>IARC: Probably not a carcinogen U.S. EPA: Evidence of noncarcinogenicity, Unlikely, Not likely, Not likely to be carcinogenic to humans CA Proposition 65: No parallel category U.S. NIH: No parallel category</p>

U.S. EPA Office of Pesticide Programs (OPP) Carcinogen List

The U.S. EPA-OPP maintains a *List of Chemicals Evaluated for Carcinogenic Potential*, which classifies pesticides by their role in causing cancer in humans and laboratory animals. The process by which chemicals are ranked involves first selecting the chemicals to

evaluate, than bringing together a panel of scientists who evaluate the available data and make a decision about a cancer ranking based on the weight of the evidence. The data evaluated includes both epidemiological studies on humans exposed to the chemical in the course of their daily lives, as well as studies on laboratory animals. Chemicals that have been studied extensively are more likely to have an accurate rating; however, this means that newer chemicals that have been on the market for less time may not have been studied sufficiently for scientists to conduct a complete evaluation.

U.S. EPA's classification of carcinogenicity has changed three times over the last 15 years. The categories used by U.S. EPA between 1986 and 1996 (1) are:

- **Category A: Known to cause cancer in humans**
Generally based on epidemiological data showing sufficient evidence to support a causal association between exposure to the substance and cancer.
- **Category B: Probable human carcinogen**
Known to cause cancer in animals but not yet definitively shown to cause cancer in humans. Category B is further split into:
 - **B1:** Sufficient evidence of carcinogenicity from animal studies with limited evidence of carcinogenicity from epidemiologic studies in humans.
 - **B2:** Sufficient evidence of carcinogenicity from animal studies with inadequate or no data from epidemiologic studies in humans.
- **Category C: Possible human carcinogen**
The data show limited evidence of carcinogenicity in the absence of human data.
- **Category D: Not classifiable as to human carcinogenicity**
This category is for chemicals for which the data are either incomplete, inadequate or ambiguous and is labeled "not classifiable" or "cannot be determined." This category is appropriate when tumor effects or other key data are suggestive or conflicting or limited in quantity and are thus not adequate to convincingly demonstrate carcinogenic potential for humans. In general, further chemical-specific and generic research and testing are needed to be able to describe human carcinogenic potential.
- **Category E:** Probably not carcinogenic, with no evidence of carcinogenicity in at least two adequate animal tests in different species in adequate epidemiologic and animal studies. This classification is based on available evidence and does not mean that the agent will not be a carcinogen under any circumstances.

The categories used by U.S. EPA between 1996 and 1999 (quoted directly from reference 2) are:

- **Known/Likely:** This category of descriptors is appropriate when the available tumor effects and other key data are adequate to convincingly demonstrate carcinogenic potential for humans; it includes:

- Agents known to be carcinogenic in humans based on either epidemiologic evidence of a combination of epidemiologic and experimental evidence, demonstrating causality between human exposure and cancer.
- Agents that should be treated as if they were known human carcinogens, based on a combination of epidemiologic data showing a plausible causal association (not demonstrating it definitively) and strong experimental evidence.
- Agents that are likely to produce cancer in humans due to the production or anticipated production of tumors by modes of action that are relevant or assumed to be relevant to human carcinogenicity.
- **Cannot be determined:** This category of descriptors is appropriate when available tumor effects or other key data are suggestive or conflicting or limited in quantity and thus, are not adequate to convincingly demonstrate carcinogenic potential for humans. In general, further agent-specific and generic research and testing are needed to be able to describe human carcinogenic potential. The descriptor 'cannot be determined' is used with a subdescriptor that further specifies the rationale:
 - Agents whose carcinogenic potential cannot be determined, but for which there is suggestive evidence that raises concern for carcinogenic effects.
 - Agents whose carcinogenic potential cannot be determined because the existing evidence is composed of conflicting data (e.g., some evidence is suggestive of carcinogenic effects, but other equally pertinent evidence does not confirm any concern), agents whose carcinogenic potential cannot be determined because there are inadequate data to perform an assessment.
 - Agents whose carcinogenic potential cannot be determined because no data are available to perform an assessment.
- **Not likely:** This is the appropriate descriptor when experimental evidence is satisfactory for deciding that there is no basis for human hazard concern, as follows (in the absence of human data suggesting a potential for cancer effects):
 - Agents not likely to be carcinogenic to humans because they have been evaluated in at least two well conducted studies in two appropriate animal species without demonstrating carcinogenic effects.
 - Agents not likely to be carcinogenic to humans because they have been appropriately evaluated in animals and show only carcinogenic effects that have been shown not to be relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha(2u)-globulin).
 - Agents not likely to be carcinogenic to humans when carcinogenicity is dose or route dependent. For instance, not likely below a certain dose range (categorized as likely by another route of exposure). To qualify, agents will have been appropriately evaluated in animal studies and the only effects

show a dose range or route limitation, or a route limitation is otherwise shown by empirical data.

- Agents not likely to be carcinogenic to humans based on extensive human experience that demonstrates lack of effect (e.g., phenobarbital).

The categories used by U.S. EPA from 1999 to the present (quoted directly from reference 2) are:

- **Carcinogenic to humans:** This descriptor is appropriate when there is convincing epidemiologic evidence demonstrating causality between human exposure and cancer. This descriptor is also appropriate when there is an absence of conclusive epidemiologic evidence to clearly establish a cause and effect relationship between human exposure and cancer, but there is compelling evidence of carcinogenicity in animals and mechanistic information in animals and humans demonstrating similar mode(s) of carcinogenic action. It is used when all of the following conditions are met:
 - There is evidence in a human population(s) of association of exposure to the agent with cancer, but not enough to show a causal association, and
 - There is extensive evidence of carcinogenicity, and
 - The mode(s) of carcinogenic action and associated key events have been identified in animals, and
 - The key events that precede the cancer response in animals have been observed in the human population(s) that also shows evidence of an association of exposure to the agent with cancer.
- **Likely to be carcinogenic to humans:** This descriptor is appropriate when the available tumor effects and other key data are adequate to demonstrate carcinogenic potential to humans. Adequate data are within a spectrum. At one end is evidence for an association between human exposure to the agent and cancer and strong experimental evidence of carcinogenicity in animals; at the other, with no human data, the weight of experimental evidence shows animal carcinogenicity by a mode or modes of action that are relevant or assumed to be relevant to humans.
- **Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential:** This descriptor is appropriate when the evidence from human or animal data is suggestive of carcinogenicity, which raises a concern for carcinogenic effects, but is judged not sufficient for a conclusion as to human carcinogenic potential. Examples of such evidence may include; a marginal increase in tumors that may be exposure-related, or evidence is observed only in a single study, or the only evidence is limited to certain high background tumors in one sex of one species. Dose-response assessment is not indicated for these agents. Further studies would be needed to determine human carcinogenic potential.

- **Data are inadequate for an assessment of human carcinogenic potential:** This descriptor is used when available data are judged inadequate to perform an assessment. This includes a case when there is a lack of pertinent or useful data or when existing evidence is conflicting, e.g., some evidence is suggestive of carcinogenic effects, but other equally pertinent evidence does not confirm a concern.
- **Not likely to be carcinogenic to humans:** This descriptor is used when the available data are considered robust for deciding that there is no basis for human hazard concern. The judgement may be based on:
 - Extensive human experience that demonstrates lack of carcinogenic effect (e.g., phenobarbital).
 - Animal evidence that demonstrates lack of carcinogenic effect in at least two well designed and well conducted studies in two appropriate animal species (in the absence of human data suggesting a potential for cancer effects).
 - Extensive experimental evidence showing that the only carcinogenic effects observed in animals are not considered relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha-2u-globulin).
 - Evidence that carcinogenic effects are not likely by a particular route of exposure.
 - Evidence that carcinogenic effects are not anticipated below a defined dose range.

About the Data: Accuracy, currency, comprehensiveness and source

The present U.S. EPA-OPP cancer list contains 443 chemicals. It was last updated by U.S. EPA on March 15, 2002. The list is presently not downloadable, but the address for requesting a hard copy of the list is:

Communication Services Branch (7506C)

Office of Pesticide Programs

US Environmental Protection Agency

1200 Pennsylvania Avenue, NW

Washington, DC 20460

Phone: (703) 305-5017; Fax: (703) 305-5558

Although there is a note that this data will be updated twice each year, in practice it seems to be published only once per year.

Reference:

1. *Office of Pesticide Programs List of Chemicals Evaluated for Carcinogenic Potential*, August 25, 1999, U.S. Environmental Protection Agency.
2. *Office of Pesticide Programs List of Chemicals Evaluated for Carcinogenic Potential*, August 30, 2000, [U.S. Environmental Protection Agency](#).

3. *Office of Pesticide Programs List of Chemicals Evaluated for Carcinogenic Potential*, March 15, 2002, [U.S. Environmental Protection Agency](#).
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U.S. EPA Toxics Release Inventory List

In 1986, Congress passed the Emergency Planning and Community Right-To-Know Act (EPCRA) and the Pollution Prevention Act (PPA), with the intent of increasing the transparency of the use and disposal of chemicals in manufacturing, mining, and other activities. Section 313 of the EPCRA and section 6607 of the PPA required companies that release toxic materials to provide information to U.S. EPA on the identity and amounts of these toxic chemicals they are releasing to air, land and water. This information is made available to the public through U.S. EPA as the Toxics Release Inventory (TRI), providing valuable information on the release and transport of toxic chemicals in the U.S.

U.S. EPA publishes a list of chemicals that must be reported. A chemical is placed on the list if it is toxic to humans or damaging to the environment. The current TRI toxic chemical list contains approximately 650 individually listed chemicals and 30 chemical groups. Of this group, only 350 individual chemicals and 25 chemical groups are pesticides or related compounds. Of these pesticide chemicals, only 222 have been formally ranked through the TRI program for their toxicity.

Toxicity categories evaluated for the TRI list of chemicals includes acute toxicity, carcinogenicity, reproductive and developmental toxicity, environmental toxicity and toxicity to organ systems including cardiovascular, liver, gastrointestinal, kidney, immune, hematological, and respiratory systems.

Environmental Defense maintains a web site called [Scorecard](#), at which you can find information on the TRI chemicals being released in your neighborhood, with a map showing the location of the responsible facilities.

References:

1. [Toxics Release Inventory and Community Right to Know](#), U.S. EPA. Viewed on October 29, 2002.
2. [What is the Toxics Release Inventory?](#), U.S. EPA, Viewed on October 29, 2002.
3. [Hazard Information on Toxic Chemicals Added to EPCRA Section 313 Under Chemical Expansion](#), U.S. EPA, Viewed on October 29, 2002.

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International Agency for Research on Cancer (IARC) Carcinogen List

A list of chemicals is maintained by IARC, an international organization that evaluates chemicals for carcinogenicity and assigns a ranking to them. The IARC system gives the following designations:

- **Group 1:** Known carcinogens
- **Group 2a:** Probable carcinogens
- **Group 2b:** Possible carcinogens

- **Group 3:** Unclassifiable because the data are incomplete or ambiguous.
- **Group 4:** Probably not carcinogens

About the Data: Accuracy, currency, comprehensiveness and source

The complete IARC carcinogen list includes carcinogen rankings for 885 agents, mixtures and exposures, not all of which are pesticides. IARC publishes peer-reviewed monographs detailing the basis for their carcinogen rankings. IARC last published a new list in December 2002, and appears to update the list several times a year. PAN updated this data on August 10, 2003.

Reference:

[Lists of IARC Evaluations](#), International Agency for Research on Cancer. Viewed on August 10, 2003.

U.S. National Toxicology Program (NTP) Carcinogen List

A list of carcinogenic substances is constructed by the National Toxicology Program, the U.S. Dept. of Health and Human Services, and the Public Health Service. This list is published by the U.S. National Institutes of Health (NIH). Section 301 (b)(4) of the Public Health Service Act mandates that the Secretary of the Department of Health and Human Services (DHHS) shall publish a biennial report that contains a list of all substances:

- which either are known to be human carcinogens or may reasonably be anticipated to be human carcinogens, and
- to which a significant number of persons residing in the United States are exposed.

The U.S. NTP system ranks chemicals as "Known Carcinogens" or "Reasonably Anticipated to Be a Carcinogen."

About the Data: Accuracy, currency, comprehensiveness and source

The U.S. NTP has an extensive, ongoing project to assess carcinogenicity. Although the complete list is only published every 2 years, there are occasional updates. See reference 2 for ongoing U.S. NTP cancer information and interim recommendations for the 11th report. The U.S. NTP dataset includes rankings for roughly 350 chemicals, not all of which are pesticides. The information in the PAN Pesticide Database was taken from the 10th Report on Carcinogens, released in December 2002. PAN last checked the currency of this data set on December 11, 2003.

References:

1. [10th Report on Carcinogens 2002](#), U.S. National Toxicology Program. Viewed on December 11, 2003.
 2. [NIH Report on Carcinogens Homepage](#). Viewed on December 11, 2003.
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State of California Proposition 65 Carcinogen List

A list of chemicals "known to the State to cause cancer" is maintained by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition

65). Unlike other rating systems, California does not rank chemicals for their carcinogenicity, but simply designates a chemical as a "Known" carcinogen.

The absence of a chemical on this list does not necessarily mean it is *not* a carcinogen. It may mean that it has not yet been evaluated by the agencies responsible. More detail is given in the "About the Data" section.

Cholinesterase Inhibitors

Proper functioning of the nervous system requires an enzyme called cholinesterase (ChE), which facilitates the transmission of nerve impulses. ChE-inhibiting pesticides disable this enzyme, resulting in symptoms of neurotoxicity---tremors, nausea, and weakness at low doses; paralysis and death at higher doses. Most of these pesticides are insecticides with a similar mechanism of action in both insects and humans.

Exposure to cholinesterase-inhibiting pesticides has been linked to impaired neurological development in the fetus and in infants, chronic fatigue syndrome, and Parkinson's disease.

About the Data: Accuracy, currency, comprehensiveness and source

Our list of ChE inhibitors was constructed based on the California Department of Pesticide Regulation's list of ChE-inhibiting pesticides (1). For pesticides not registered in California, the chemical structure or Material Safety Data Sheet (MSDS) was used to classify the pesticide as a cholinesterase inhibitor. This data was last updated July 10, 2000 by PAN Staff. This list is relatively static, since few newly registered pesticides are cholinesterase inhibitors.

References:

1. *Summary of Pesticide Use Report Data, 1998*, [Table 5A](#), California Department of Pesticide Regulation (Sacramento, CA, November 1999). Viewed on October 31, 2002.
2. PAN staff evaluation of chemical structures and toxicity using: [Chem Finder](#), Materials Safety Data Sheets (MSDS), and *The Pesticide Manual*, 11th edition, C. D. S. Tomlin, Ed., [British Crop Protection Council](#) (Farnham, Surrey, UK, 1997).

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Other Neurotoxic Pesticides

Some pesticides cause neurotoxicity that is unrelated to cholinesterase inhibition. Exposure to neurotoxic pesticides has been linked to impaired cognitive development in children, behavioral abnormalities, and Parkinsons disease. The U.S. EPA [Toxics Release Inventory](#) list provides information on the neurotoxicity of the chemicals in the list, but not for all pesticides.

CA Groundwater Contaminant

A number of pesticides, primarily herbicides and soil fumigants, have been found repeatedly in California groundwater. These compounds are labeled as **known** groundwater contaminants. Most of these chemicals are on a list maintained by the California Department of Pesticide Regulation (DPR); however, pesticides that were banned from use in California before they were evaluated for groundwater contaminating potential are not included in DPR's lists. PAN staff has added these chemicals from California groundwater monitoring reports (1).

Another group of pesticides, labeled as **potential** groundwater contaminants by DPR, have the potential to move into groundwater based on their [water solubility](#), ability to bind to soils (K_{oc}), and [half-life](#). Not all pesticides have been evaluated for leaching potential. DPR evaluates *only* agricultural use pesticides that are spread on the soil or are applied through injection or chemigation, and *generally* only evaluates pesticides registered for use in California.

California law (3) requires DPR to annually report to the Legislature, the Office of Environmental Health Hazard Assessment, and the State Water Resources Control Board information regarding the status of the ground water protection data gaps of pesticidal active ingredients registered for agricultural use, the pesticide active ingredients with data exceeding Specific Numerical Values (SNVs), and sales and use information.

Specific Numeric Values (SNVs) for parameters that define leaching potential have been submitted to DPR by manufacturers and DPR evaluates and approves these submissions (2). Active ingredients with properties that exceed the SNVs established by DPR are considered to have the potential to contaminate ground water. Pesticide active ingredients are placed on the list of potential leachers under the following conditions:

One of the following must be true

- Water solubility: > 3 ppm (mg/L), or
- Soil adsorption coefficient (K_{oc}): < 1,900 cm³/g

and one of the following must be true

- Hydrolysis half-life: > 14 days, or
- Aerobic soil metabolism half-life: > 610 days, or
- Anaerobic soil metabolism half-life: > 9 days

According to the California Pesticide Contamination Prevention Act, the California Department of Pesticide Regulation (DPR) is responsible for listing pesticides that are known or potential groundwater contaminant pesticides in Section 6800(a) and (b) of the California Code of Regulations and taking action to prevent groundwater contamination (3, 4, 5). Present regulations (as of July 2003) establish Pesticide Management Zones (PMZs)

where pesticides that have been found in groundwater may no longer be used. The regulations in reference 5 list the PMZs across the state.

As of May 2003, new regulations are under consideration by DPR to designate Groundwater Protection Areas in the state in which use of both known and potential groundwater contaminants is prohibited, unless certain restrictions are observed (5, 6). The most recent list of known and potential groundwater contaminant pesticides can be found in reference 10, although these have not yet been added to the regulation. Publications related to the groundwater protection program at California Department of Pesticide Regulation can be found on the [Environmental Monitoring publications web page](#) and on DPR's [Groundwater Protection Program home page](#).

About the Data: Accuracy, currency, comprehensiveness and source.

The data in the PAN Pesticide Database were last updated July 14, 2003 from the *2001 Groundwater Status Report*. An updated set of groundwater regulations were released in May of 2003 by DPR and should be finalized in the near future. In the meantime, the most current listing of groundwater contaminants can be found in the *2001 Status Report* (reference 10) combined with a look at sections 6800(a) and (b) of the California Code of Regulations (reference 5). The two lists do not match exactly because of changes in registration status of pesticides between the time one list was published and the other was published.

References:

1. See B. Heavner, [Toxics on Tap: Pesticides in California Drinking Water Sources](#) and references therein, California Public Interest Research Group Charitable Trust and Californians for Pesticide Reform. Viewed on November 8, 2002.
2. B. Johnson, *Setting Revised Specific Numeric Values*, California Department of Pesticide Regulation, April 1991. [Download](#). Viewed on July 14, 2003.
3. [Pesticide Contamination Prevention Act](#), California Codes, Food and Agricultural Code, Division 7, Chapter 2, § 13144, 13145, 13149. Viewed on July 14, 2003.
4. California Department of Pesticide Regulation [In-house Legislative information](#). Groundwater-specific regs [here](#). Viewed on July 14, 2003.
5. [Pesticide Contamination Prevention Groundwater Protection List](#), California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, § 6800. Viewed on July 14, 2003.
6. [2000 Rulemaking Calendar](#), California Department of Pesticide Regulation, February 2000. Viewed on October 31, 2002.
7. W. Kollman, *1999 Status Report Pesticide Contamination Prevention Act*, California Department of Pesticide Regulation, December 1999. [Download](#). Viewed on July 14, 2003.
8. Guo, F., D. Bartkowiak, D. Weaver, J. Troiano, M. Peple, F. Spurlock, and C. Nordmark. *2000 Update of the Well Inventory Database*, California Department of Pesticide Regulation, [Download](#). Viewed on July 14, 2003.

9. Kollman, W. and F. Guo, *2000 Status Report Pesticide Contamination Prevention Act*, California Department of Pesticide Regulation, [Download](#). Viewed on July 14, 2003.
10. Schuette, J.P., *2001 Status Report Pesticide Contamination Prevention Act*, California Department of Pesticide Regulation, [Download](#). Viewed on July 14, 2003.

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PAN Groundwater Contaminant Rating

There are several compounds that have been found repeatedly in groundwater in California (and elsewhere), but are not regulated as groundwater contaminants in California. In order to capture this information, PAN has gone beyond the California Department of Pesticide Regulation (DPR) list of Known groundwater contaminants to create a new category called PAN Known groundwater contaminants. We draw this information from other data sources that show repeated detections of the pesticide in groundwater, although not necessarily in California (1, 2).

There are three reasons why compounds classified as PAN Known groundwater contaminants may not be classified by DPR as Known groundwater contaminants.

1. The pesticide in question is no longer registered for use in California. This is the case for older pesticides such as dibromochloropropane (DBCP), 1,2-dichloropropane (1,2-D), and ethylene dibromide (EDB), as well as for some of the breakdown products from triazine or acetanilide herbicides.
2. The pesticide in question is not used in large amounts in California, so the pesticide has not been detected in California groundwater; however, data from other states or countries provides ample evidence of groundwater contamination when substantial amounts of the pesticide are used.
3. DPR uses an arbitrary method of verifying detections of pesticides in groundwater, classifying well water samples according to the following scheme (quoted directly from reference 2):

Negative: "Well water samples were designated as negative if pesticide residues were not detected at or above the minimum detection limit (MDL) of the method used for analysis.

Positive: "If pesticide residues were detected at or above the MDL, samples were classified into one of three categories:

- **Unconfirmed:** Pesticide residues were detected in only one sample during a single monitoring survey. Confirmation of the initial detection by a second positive sample was not possible because either only a single sample was taken from the well or analyses of all other samples taken from the well during the survey were negative.

- **Confirmed, unverified:** Pesticide residues were detected in two discrete samples taken from a well during a monitoring survey. A confirmed detection is unverified unless it meets the criteria of a verified detection.
- **Verified:** Confirmed detections are verified if they meet the criteria specified in California Food and Agricultural Code section 13149(d) of the Pesticide Contamination Prevention Act (1). Section 13149(d) requires that the detection of a pesticide in ground water results either from an analytical method approved by the department that provides unequivocal identification of a chemical, or from verification within 30 days by a second analytical method or a second analytical laboratory approved by DPR. The Department of Pesticide Regulation has set criteria to determine whether the detection of a pesticide or its breakdown product(s) in ground water meets the standards of section 13149(d)."

Since chemicals are not classified as "Known" groundwater contaminants unless their detections in ground water samples are "verified", pesticides could miss being classified as a "verified" contaminant simply because DPR decided not to re-sample a well or decided to take only a single sample, a landowner denied access to the well, or any number of other reasons that have nothing to do with the actual presence of a pesticide in groundwater samples (2).

References:

1. J.E. Barbash and E. A. Resek, *Pesticides in Ground Water: Distribution, Trends, and Governing Factors*, Ann Arbor Press, Inc. (Chelsea, Mich., 1996).
2. W. Kollman, *2000 Status Report Pesticide Contamination Prevention Act*, California Department of Pesticide Regulation, December 2000. [Download](#). Viewed on October 31, 2002.
3. [California Codes](#), Food and Agricultural Code, Division 7, Chapter 2, § 13144, 13145, 13149. Viewed on June 13, 2005.

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California Proposition 65

Also known as the Safe Drinking Water and Toxic Enforcement Act of 1986, this law requires the State of California to maintain a list of chemicals known to cause cancer, reproductive harm, or developmental harm and to update the list at least annually (1). The absence of a chemical on this list does not necessarily mean it is *not* toxic. It may mean that it has not yet been evaluated by the agencies responsible.

The Safe Drinking Water and Toxic Enforcement Act of 1986, better known as Proposition 65, was adopted by the voters of California as a ballot initiative in November, 1986. Proposition 65 is not a stand-alone statute, but amends the California Health and Safety

Code (2). Proposition 65 requires the Governor, through California EPA's Office of Environmental Health Hazard Assessment ([OEHHA](#)), to develop and regularly update a list of chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm.

There are approximately 800 chemicals and related compounds on the list as of August 10, 2003 (3). The listed chemicals include dyes, solvents, pesticides, drugs, food additives, and by-products of certain processes. Chemicals are added to the list in one of three ways.

1. If two independent committees of scientists, appointed by the governor, find that the chemical has been clearly shown to cause cancer or reproductive harm, the chemical can be added to the list. This listing mechanism is abbreviated SQE-- "state's qualified experts" and is described in 22 CCR 12305 (a)(1).
2. If a chemical has been classified as a carcinogen or as a reproductive toxicant by a designated "authoritative body", it can be added to the list. Organizations designated as authoritative under Prop 65 include the US Environmental Protection Agency, the US Food and Drug Administration, and the National Institute for Occupational Safety and Health, among others. This listing mechanism is abbreviated AB - "authoritative bodies" and is described in 22 CCR 12306.
3. Finally, a chemical can be added to the list if any state or federal government agency requires it to be labeled or identified as either a carcinogen or a reproductive toxicant. This listing mechanism is abbreviated FR -- "formally required to be labeled or identified" and is described in 22 CCR 12902.

Prop 65 contains a prohibition on the discharge, above specified risk levels, of listed compounds into any waterway that could be a source of drinking water. The prohibition provides that "no person in the course of doing business shall knowingly discharge or release a chemical known to the state to cause cancer or reproductive toxicity into water or onto or into land where such chemical passes or probably will pass into any source of drinking water" (Sec 25249.5). A "person in the course of doing business" is defined as a business employing 10 or more people (Sec 25249.11), so the discharge prohibitions do not apply to state, county, or city governments, or to local sanitation districts (4).

Prop 65 also requires that businesses provide a "clear and reasonable" warning (section 25249.6) before knowingly and intentionally exposing anyone to a listed chemical at levels above a specified risk level. Such a warning can be given in a variety of forms, such as the labeling of a consumer product, posting of signs at the workplace, or publication of notices in a newspaper. Any company with ten or more employees that operates within the State or sells products in California must comply with this requirement of Proposition 65.

About the Data: Accuracy, currency, comprehensiveness and source

The Proposition 65 list is maintained by California EPA's Office of Environmental Health Hazard Assessment. This list is required by law to be updated annually, although in practice it is updated several times a year. OEHHA's last update was May 27, 2005. PAN last checked the currency of data on June 13, 2005.

References:

1. [Proposition 65](#), CA Office of Environmental Health Hazard Assessment (OEHHA). Viewed on June 13, 2005.
2. *California Health and Safety Code*, [Section 25180, 25180.7, 25189.5, 25192, 25249.5-25249.13](#); see also Title 22, [California Code of Regulations](#), Section 12000, et seq. Viewed on June 13, 2005.
3. [Proposition 65 in Plain Language](#), CA Office of Environmental Health Hazard Assessment (OEHHA). Viewed on June 13, 2005.
4. W. R. Attwater and J. Markle, "Overview of California Water Rights and Water Quality Law," *California Environmental Laws 1996*, West Publishing Co. (St. Paul, MN, 1996), page XLIV.

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CA Toxic Air Contaminant (TAC)

California's Toxic Air Contaminant Act, passed in 1984 (1, 2), created the statutory framework for the evaluation and control of chemicals as toxic air contaminants (TACs). TACs are defined in the statute as air pollutants that "may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health" (1).

The law focuses on the evaluation and control of pesticides in ambient community air. In general, the goal of the program is to estimate the amount of pesticides present in the air (based on the results of monitoring studies) and then estimate the likelihood that these levels could impact human health (based on health effects data and other related data). This is referred to as the "Risk Assessment Phase." Based on these results, DPR must then determine if reductions in exposure, and concomitant changes in the way the pesticide is used, are needed in order to protect human health.

If reductions are deemed necessary, DPR must coordinate with the agricultural commissioners, air pollution control districts, and air quality management districts to develop control measures that will reduce emissions to levels that adequately protect public health. This is referred to as the "Risk Management Phase." Measures to reduce emissions which may include requiring additional training for applicators, restricting where or how the pesticide can be used, or even cancelling (banning) the use of the product.

The California Department of Pesticide Regulation (DPR) is responsible for the evaluation of pesticides as TACs and the California Air Resources Board (ARB) is responsible for regulating other air toxics (3, 4). ARB also conducts air monitoring for DPR.

A list of candidate TACs was compiled by DPR in 1996 (5). As of early 2002, only three chemicals have been designated as TACs by DPR. Several others are under evaluation, and monitoring studies have been completed by ARB for approximately 40 pesticides. A number of other pesticides are listed as California TACs because they are also listed by the

U.S. EPA as [Hazardous Air Pollutants](#). A critical evaluation of DPR's progress in implementing the law can be found in reference 9.

About the Data: Accuracy, currency, comprehensiveness and source

The Toxic Air Contaminant list in the PAN database is derived from DPR's Candidate List document published in 1996 (5), the list in the California Code of Regulations (6), and ARB's list published in 1996 (7), updated with a list obtained from the ARB (8). Some chemicals are listed as groups. For these chemicals, PAN applied the chemical group categories to individual compounds in the data set. For example, the list includes a group called "2,4-D salts and esters", so all 2,4-D salts and esters in the database were labeled as TACs. The data are current as of January 19, 2005.

References:

1. [California Code of Regulations](#), Division 7, Chapter 3, Article 1.5, Section 14021. Viewed on June 13, 2005.
2. [What is DPR's Toxic Air Contaminant Program?](#), CA DPR. Viewed on June 13, 2005.
3. [California Air Toxics Program Background](#), CA ARB. Viewed on June 13, 2005.
4. [Toxic Air Contaminant Fact Sheets](#), CA ARB. Viewed on June 13, 2005.
5. *Pesticides for evaluation as Candidate Toxic Air Contaminants*, October 1996, CA DPR (Available from DPR by request only; no longer posted on web site).
6. [California Code of Regulations, Division 6, Chapter 4, Subchapter 2, Article 1, Section 6860](#). Viewed on June 13, 2005.
7. *Toxic Air Contaminant Identification List*, June 1996, [CA ARB](#). Also available in pdf. [Download](#). Viewed on June 13, 2005.
8. Personal communication with [Lynn Baker](#), CA ARB.
9. Z. Ross and J. Kaplan, [Poisoning the Air: Airborne Pesticides in California](#), 1998, California Public Interest Group Charitable Trust and Californians for Pesticide Reform. Viewed on June 13, 2005.

Reproductive and developmental toxicity

Some pesticides are known to cause birth defects or interfere with normal development. [Weight-of-the-evidence](#) evaluations of this type of toxicity have been conducted by the [State of California](#) and by the [U.S. EPA](#) under its Toxics Release Inventory program. Many pesticides that disrupt endocrine functions also cause reproductive and developmental harm, as well as other adverse effects. The absence of a chemical on any of these lists does not necessarily mean it is *not* a reproductive or developmental toxicant. It may mean that it has not yet been evaluated.

[California Proposition 65 List](#)

[U.S. EPA Toxics Release Inventory List](#)

California Proposition 65 List

Pesticides determined by the state of California to cause reproductive and developmental harm, e.g., birth defects, infertility, sterility and impairment of normal growth and development. A list of chemicals "known to the State to cause reproductive and developmental toxicity" is maintained by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

The absence of a chemical on this list does not necessarily mean it is *not* a reproductive or developmental toxicant. It may mean that it has not yet been evaluated by the agencies responsible. More detail is given in the "About the Data" section.

[About the Data](#)

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U.S. EPA Toxics Release Inventory List

In 1986, Congress passed the Emergency Planning and Community Right-To-Know Act (EPCRA) and the Pollution Prevention Act (PPA), with the intent of increasing the transparency of the use and disposal of chemicals in manufacturing, mining, and other activities. Section 313 of the EPCRA and section 6607 of the PPA required companies that release toxic materials to provide information to U.S. EPA on the identity and amounts of these toxic chemicals they are releasing to air, land and water. This information is made available to the public through U.S. EPA as the Toxics Release Inventory (TRI), providing valuable information on the release and transport of toxic chemicals in the U.S.

U.S. EPA publishes a list of chemicals that must be reported. A chemical is placed on the list if it is toxic to humans or damaging to the environment. The current TRI toxic chemical list contains approximately 650 individually listed chemicals and 30 chemical groups. Of this group, only 350 individual chemicals and 25 chemical groups are pesticides or related compounds. Of these pesticide chemicals, only 222 have been formally ranked through the TRI program for their toxicity.

Toxicity categories evaluated for the TRI list of chemicals includes acute toxicity, carcinogenicity, reproductive and developmental toxicity, environmental toxicity and toxicity to organ systems including cardiovascular, liver, gastrointestinal, kidney, immune, hematological, and respiratory systems.

Environmental Defense maintains a web site called [Scorecard](#), at which you can find information on the TRI chemicals being released in your neighborhood, with a map showing the location of the responsible facilities.

References:

1. [Toxics Release Inventory and Community Right to Know](#), U.S. EPA. Viewed on June 13, 2005.
2. [What is the Toxics Release Inventory?](#), U.S. EPA, Viewed on June 13, 2005.

3. [Hazard Information on Toxic Chemicals Added to EPCRA Section 313 Under Chemical Expansion](#), U.S. EPA, Viewed on June 13, 2005.

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Pesticide Action Network (PAN) Summary Endocrine Disruptor Rating

The PAN suspected endocrine disruptor (ED) designation is based on several different sources of information (see below). Because ratings from different sources sometimes conflict with each other and because there is not yet an "official" list of EDs, PAN created a summary ED designation that designates any chemical that is listed as potentially endocrine disrupting by any of the sources is ranked as a **Suspected** endocrine disruptor.

About the data: Accuracy, currency, comprehensiveness and source

PAN staff last updated this list in December 2002, adding the Danish EPA list and EU prioritization list at that time. Most of the lists are static lists in published works and do not change, with the exception of the *Our Stolen Future* web site which is updated several times per year.

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Illinois EPA List

In 1997, the Illinois state EPA published a list of endocrine disrupting compounds. The list contains three categories of endocrine disrupting chemicals corresponding to the overall evidence available that the chemical is capable of disrupting the endocrine system:

- **Known:** Chemicals for which strong evidence exists that endocrine-disrupting effects occur in intact animals.
- **Probable:** Chemicals for which the preponderance of the evidence (in both intact animals and in bioassays) suggests that the chemical can cause disruption of the endocrine system.
- **Suspected:** Chemicals lacking good evidence in intact animals or for which only assay evidence of endocrine disruption exists.

About the Data: Accuracy, currency, comprehensiveness and source

These data were taken from the *Report on Endocrine Disrupting Chemicals*, Illinois EPA (February, 1997). To our knowledge, this list has not been updated. At the time the list was published, U.S. EPA Headquarters was just beginning to evaluate endocrine disruptors under the mandate of the Food Quality Protection Act.

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Danish EPA List of Endocrine Disrupting Auxiliaries

In 2000, the Danish EPA published a list of compounds used as "inerts" or adjuvants in pesticide products which - based on available information - the Danish EPA considers to have estrogenic effects or to be capable of decomposing into estrogenic compounds.

In the autumn of 1995 the Danish EPA published the report “Environmental Project no. 292: Male Reproductive Health and Environmental Chemicals with Estrogenic Effects”. Following up the report the Danish Government announced the goal of phasing out by the year 2000 all pesticides containing estrogenic auxiliary matters. The chemicals are added to the products for various reasons - e.g. to enhance the effect of the active ingredients in the pesticide.

About the Data: Accuracy, currency, comprehensiveness and source

These data were taken from the document entitled [Auxiliary Matters with Estrogenic Effects](#), Danish EPA, April, 2000. PAN last checked the currency of this data set on June 13, 2005.

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European Union (EU) Prioritization List

In December 1999, the European Commission adopted a strategy for addressing the problem of endocrine-disrupting chemicals. Part of this strategy was to establish a priority list of substances for further evaluation of their role in endocrine disruption. The list is to be used to identify substances for priority testing, once test methods become available, and to identify gaps in knowledge of the toxicity and exposure pathways.

Prioritization was based on evidence of endocrine disruption in humans or animals and on the exposure potential for the chemical based on persistence in the environment and the amount of the substance produced. The starting point of the study was a working list, compiled from the lists of suspected endocrine disrupting chemicals drawn up by various organizations as well as from an up-to-date literature search. The list contains three categories of endocrine disrupting chemicals:

- **Group I** : At least one study providing evidence of endocrine disruption in an intact organism. Not a formal weight of evidence approach.
- **Group II** : Potential for endocrine disruption. In vitro data indicating potential for endocrine disruption in intact organisms. Also includes effects in-vivo that may, or may not, be ED-mediated. May include structural analyses and metabolic considerations
- **Group III** : Substances which meet the criteria of High Production Volume and/or persistence in the environment for which: a) no or insufficient data are available, or b) sufficient data are available for evaluation, but the compounds are not presently considered to be endocrine disrupters.

The lists of chemicals were distributed among groups of experts for classification using the following guidelines and criteria:

- If reliable in-vivo evidence for endocrine disruption was available, the substance was placed in Group I;
- If less reliable in-vivo evidence for endocrine disruption was available (for example in case of contradictory test results), the substance was placed in Group II;

- If only in-vitro evidence for endocrine disruption was available with positive test results, the substance was placed in Group II;
- Substances with no data but closely related to substances categorized as category 1 were placed in Group II;
- Substances with no data but closely related to substances categorized as category 2 were placed in Group II;
- Substances with no evidence for endocrine disruption or no data and not related to Group I or II substances were placed in Group III.

About the Data: Accuracy, currency, comprehensiveness and source

These data were taken from the report *Towards the Establishment of a Priority List of Substances for Further Evaluation of Their Role in Endocrine Disruption*, Appendix 1, BKH Consulting Engineers and TNO Nutrition and Food Research (June 21, 2000).

References:

1. [Communication from the Commission to the Council and the European Parliament, Community Strategy for Endocrine Disrupters, COM \(99\)706](#). Viewed on June 13, 2005.
2. [Towards the Establishment of a Priority List of Substances for Further Evaluation of Their Role in Endocrine Disruption, Appendix 1](#), BKH Consulting Engineers and TNO Nutrition and Food Research (June 21, 2000). Viewed on June 13, 2005.
3. [Opinion on BKH Consulting Engineers Report "Towards the Establishment of a Priority List of Substances . . ."](#), Opinion adopted at the 17th CSTEE plenary meeting, Brussels, September 5, 2000, Scientific Committee for Toxicity, Ecotoxicity and the Environment. Viewed on June 13, 2005.

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Colborn list

A list of suspected endocrine disrupting chemicals was published in the scientific literature in 1993 by Theo Colborn (1), followed by the popular book for the layperson *Our Stolen Future* (2). The book highlighted the effects of endocrine disrupting chemicals on humans and the environment and was instrumental in raising public awareness of the need to find out more.

In this reference, chemicals are not ranked according to their endocrine-disrupting effects, thus the rating simply describes whether the chemical is contained in the reference or not.

About the Data: Accuracy, currency, comprehensiveness and source

The chemicals listed in the PAN database are taken from reference 1. Colborn's current list can be found at the web site in reference 3. The PAN Pesticide Database was last updated from this site in July 2004.

References:

1. T. Colborn, F.S. Vom Saal and A.M. Soto, "Developmental effects of endocrine-disrupting chemicals in wildlife and humans," *Environmental Health Perspectives*, 1993, v. 101, pp. 378-384.
2. T. Colborn, D. Dumanoski, and J.P. Myers, *Our Stolen Future*, Penguin Books (New York, 1996).
3. *Widespread pollutants with reproductive and endocrine-disrupting effects*, *Our Stolen Future* [web site](#). Viewed on June 13, 2005.

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Keith List

Lawrence Keith is the author of a book on environmental endocrine disruptors. Published in 1997, this book summarizes the endocrine disrupting effects of approximately 50 pesticides and industrial chemicals. In this reference, chemicals are not ranked according to their endocrine-disrupting effects, thus the rating simply describes whether the chemical is contained in the reference or not.

About the Data: Accuracy, currency, comprehensiveness and source

These data were taken from Lawrence H. Keith's, *Environmental Endocrine Disruptors: A Handbook of Property Data*, Wiley Interscience (New York, 1997). This is a published book, so no updates are possible until a second edition is published.

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Benbrook list

Charles Benbrook is the author of a report on endocrine disruptors written for the National Campaign for Pesticide Policy Reform. This report lists a number of compounds as suspected endocrine disruptors. In this reference, chemicals are not ranked according to their endocrine-disrupting effects, thus the rating simply describes whether the chemical is contained in the reference or not.

About the Data: Accuracy, currency, comprehensiveness and source

These data were taken from Charles M. Benbrook's, *Growing Doubt: A Primer on Pesticides Identified as Endocrine Disruptors and/or Reproductive Toxicants*, National Campaign for Pesticide Policy Reform (Washington, DC, September 1996). This is a published report and will only be updated if a second edition is published.