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Subject:	NOIL - furfuryl alcohol
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Attachments:	image001.png EPA Web Site on Chemical Review.pdf Furfuryl Alcohol Final 9-30-15.pdf OPP Chemicals Evaluated for Cancer 2 Oct 2014.pdf

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Attached please find the comments of the Flavor and Extract Manufacturers Association of the United States concerning furfuryl alcohol. Also attached please find two attachments to the comments. There are three PDF documents attached to this email. Please confirm OEHHA's timely receipt of these comments. Thank you. Best regards,
Gary Roberts & Jay Murray

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Furfuryl Alcohol

Should Not be Listed as a Proposition 65 Carcinogen

Pursuant to the Authoritative Bodies Listing Process

Comments of

Flavor and Extract Manufacturers Association

of the United States

Submitted to the
Office of Environmental Health Hazard Assessment

by

F. Jay Murray, Ph.D.
Gary M. Roberts

September 30, 2015

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I. Introduction and Overview

Furfuryl alcohol should not be listed as a carcinogen because (1) US EPA did not "formally identify" furfuryl alcohol as causing cancer, and (2) U.S. EPA did not rely on enough information to satisfy the "sufficient evidence" requirement. See 27 CCR §§ 25306(d), 25306(e).

The Carcinogen Assessment Review Committee (CARC), a committee within the US EPA's Office of Pesticide Programs ("OPP") only made a *recommendation* that furfuryl alcohol be classified as "Likely to Be Carcinogenic to Humans." The report containing the CARC recommendation, was not a final action of the Agency, and there is evidence that US EPA has not accepted this recommendation.

The data suggesting carcinogenic activity for furfuryl alcohol come from National Toxicology Program (NTP) Technical Report No. 482 (TR-482).[1] Yet, the recommended classification by the CARC conflicts with the conclusions of the NTP, the authoritative body that actually conducted the cancer bioassay of furfuryl alcohol on which the CARC relied. OEHHA's scientific review of the CARC report pursuant to section 25306(e) of the regulations should conclude that there is not sufficient data to list furfuryl alcohol for the scientific reasons noted below. Moreover, there is no question that the NTP's analysis of furfuryl alcohol was far more detailed and more thorough. Since the less thourough CARC analysis contains analytical flaws and does not explain why the CARC came to a different conclusion from the NTP, OEHHA should delcine to list furfuryl alcohol based on the CARC report. If OEHHA were to list furfuryl alcohol based on the CARC report, we believe it would break new ground by basing a

[1] National Toxicology Program (NTP). 1999. NTP Technical Report on the Toxicology and Carcinogenesis Studies of Furfuryl Alcohol (CASRN 98-00-0) in F344/N Rats and B6C3F1 Mice. NTP TR 482. NIH Publication No. National Toxicology Program, Research Triangle Park, NC.

listing on a weaker analysis that is not subject to any outside review which differs with a clearly more detailed, more thorough analysis by the entity that undertook the study upon which the listing is proposed, with no new or additional data.

The CARC relied solely upon the results of the NTP cancer bioassay of furfuryl alcohol in making its classification recommendation, and it did not rely on sufficient data to meet the criteria of "sufficient evidence" in animals, as required by the Proposition 65 regulations.[2] For example, the CARC considered the kidney tumors in male mice to be rare when compared to the historical control incidence. But, the CARC did not consider that the furfuryl alcohol study employed an extended evaluation of the kidneys that included approximately 8 additional sections; in contrast, the historical control studies typically used only a single section. Compared to the historical controls, the methodology used to evaluate the kidneys in the furfuryl alcohol study provided a greater opportunity to detect kidney tumors.

The high dose level of furfuryl alcohol given to male rats exceeded the Maximum Tolerated Dose (MTD) since no male rats survived to the end of the study. This was the only dose considered by the CARC to increase incidence of nasal tumors in rats. The CARC did not consider the possibility that the excessively high dose may result in tumor effects that are secondary to the toxicity rather than directly attributable to the agent, as described by the US EPA Guidelines (2005).

For these and other reasons, the Flavor and Extract Manufacturers Association of the United States (FEMA) opposes the listing of furfuryl alcohol as a Proposition 65 carcinogen.

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[2] Section 25306(e)(2)

II. US EPA did not "formally identify" furfuryl alcohol as causing cancer.

In order to list furfuryl alcohol via the authoritative bodies mechanism, the authoritative body must "formally identify" it as causing cancer according to the Proposition 65 regulations.[3] The OEHHA Notice cites a report by CARC (the CARC Report) as the basis for the proposed authoritative body listing of furfuryl alcohol. The role of the CARC is to make a cancer classification ***recommendation*** to the US EPA Office of Pesticide Programs. The US EPA Office of Pesticide Programs is free to choose whether it accepts or does not accept the recommendation of the CARC. In the case of furfuryl alcohol, there is evidence that the US EPA Office of Pesticide Programs has not accepted the recommendation of the CARC.

The role of the CARC is advisory. According to the US EPA website, the CARC ***recommends*** a cancer classification:

> "The Health Effects Division of the Office of Pesticide Programs performs an independent review of studies conducted in mice and rats to evaluate the carcinogenic potential of pesticides. The results of the independent review are peer-reviewed by the Cancer Assessment Review Committee. This committee ***recommends*** a cancer classification."[4]

It appears that the US EPA Office of Pesticide Programs did not adopt the recommendation of the CARC with respect to furfuryl alcohol. The US EPA Office of Pesticide Programs publishes an Annual Cancer Report, which contains a list of all of the chemicals evaluated for carcinogenic potential by the Office of Pesticide Programs,

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[3] Section 25306(d)

[4] http://www.epa.gov/pesticides/health/cancerfs.htm (last accessed on 29 September 2015).

including the cancer classification of each chemical. The most recent Annual Cancer Report was published by the Office of Pesticide Programs on October 2, 2014, and furfuryl alcohol is not listed as "Likely to Be Carcinogenic to Humans" or mentioned in this report.[5] There is no indication that the Office of Pesticide Programs accepted or agreed with the recommendation of the CARC.

The absence of furfuryl alcohol from the most recent Annual Cancer Report dated October 2, 2014 is not explained by an issue with timing. The final CARC Report is dated February 6, 2014.[6] As such, there was about 8 months between the date of the final CARC Report and the publication of the Annual Cancer Report. Of note, another chemical, furfural, was also evaluated at the same time (and in the same CARC Report as furfuryl alcohol), and, unlike furfuryl alcohol, the CARC's recommended classification is recognized and listed in the Annual Cancer Report dated October 2, 2014.[7] Therefore, it appears that the Office of Pesticide Programs has not accepted the CARC's recommendation for furfuryl alcohol, and as such, the CARC recommendation for furfuryl alcohol has not been adopted or used for regulatory purposes. Section 25306(d) of the Proposition 65 regulations states:

> "(d) For purposes of this section a chemical is "formally identified" by an authoritative body when the lead agency determines:
>
> (1) the chemical has been included on a list of chemicals causing cancer or reproductive toxicity issued by the authoritative body, or is the subject of a report which is published by the authoritative body and which concludes that the

[5] http://npic.orst.edu/chemicals_evaluated.pdf (last accessed 29 September 2015). This document, at page 1, also describes the CARC Report as a recommendation.
[6] Id.
[7] Id.

chemical causes cancer or reproductive toxicity; or has otherwise been identified as causing cancer or reproductive toxicity by the authoritative body in a document that indicates such identification is a final action; and

(2) the list, report, or document specifically and accurately identifies the chemical, and has been:

(A) Reviewed by an advisory committee in a public meeting, if a public meeting is required, or

(B) Made subject to public review and comment prior to its issuance, or

(C) Published by the authoritative body in a publication, such as, but not limited to, the federal register for an authoritative body which is a federal agency, or

(D) Signed, where required, by the chief administrative officer of the authoritative body or a designee, or

(E) Adopted as a final rule by the authoritative body, or

(F) Otherwise set forth in an official document utilized by the authoritative body for regulatory purposes."

The CARC Report does not satisfy any of the requirements of 25306(d). It is not a list, and it is not a published report. The report does not state that it is the final action of OPP or of the USEPA. It is not reviewed by an advisory committee in a public meeting, made subject to public review, published in a publication such as the federal register, signed by the chief administrative officer or a designee, adopted as a final rule, or set forth in an official document utilized for regulatory purposes. To the contrary, the

CARC Report simply makes a recommendation, which has not been adopted by the US EPA.

III. The recommended classification of furfuryl alcohol by the CARC as "Likely to Be Carcinogenic to Humans" is based on insufficient evidence and is inconsistent with NTP's conclusions.

OEHHA has proposed that furfuryl alcohol meets the criteria for listing as known to the state to cause cancer under Proposition 65, based on a 2014 report by the CARC in the Health Effects Division of the Office of Pesticide Programs. The CARC recommended classifying furfuryl alcohol as "Likely to Be Carcinogenic to Humans" based on:

> "(i) Treatment-related nasal tumors (adenomas, carcinomas and/or squamous cell carcinomas observed in male rats.; [sic]
>
> (ii) Treatment-related kidney tumors (adenomas, carcinomas and/or combined adenomas/carcinomas observed in male mice; [sic]"[8]

Importantly, the CARC relied entirely on the NTP cancer bioassay of furfuryl alcohol, which was reported in an NTP Technical Report (TR-482). NTP, like US EPA, has been designated as an authoritative body under Proposition 65. However, NTP came to a different conclusion regarding the results of its cancer bioassay than did the CARC.

It is significant that the NTP's conclusions regarding the carcinogenic potential of furfuryl alcohol based on the results of its own cancer bioassay fail to satisfy the authoritative bodies listing criteria of Proposition 65. Based on OEHHA's interpretation

[8] CARC Report at 42.

of Section 25306(e)(2), in order to list furfuryl alcohol as a carcinogen via the authoritative bodies listing mechanism based on the conclusions of NTP in its cancer bioassay, NTP must conclude that there are at least two instances of "clear evidence of carcinogenic activity" in its cancer bioassay. Notably, NTP concluded that there was no "clear evidence of carcinogenic activity" in either rats or mice in its cancer bioassay. NTP concluded:

> "Under the conditions of these 2-year inhalation studies, there was *some evidence of carcinogenic activity* of furfuryl alcohol in male F344/N rats based on increased incidences of combined neoplasms of the nose. There was *equivocal evidence of carcinogenic activity* of furfuryl alcohol in female F344/N rats based on marginally increased incidences of neoplasms of the nose and renal tubule neoplasms. There was *some evidence of carcinogenic activity* of furfuryl alcohol in male B6C3F$_1$ mice based on increased incidences of renal tubule neoplasms. There was *no evidence of carcinogenic activity* of furfuryl alcohol in female B6C3F1 mice exposed to 2, 8, or 32 ppm."[9]

NTP's conclusions regarding the results of its own cancer bioassay of furfuryl alcohol fall far short of meeting the requirements of "sufficient evidence" in animals, as detailed in Section 25306(e)(2). Thus, furfuryl alcohol cannot be listed as a carcinogen via the authoritative bodies listing mechanism based on NTP's conclusions about the results of its own study.

The CARC has relied exclusively upon the results of the NTP cancer bioassay to recommend classifying furfuryl alcohol as "Likely to Be Carcinogenic to Humans." It is

[9] http://ntp.niehs.nih.gov/results/pubs/longterm/reports/longterm/tr400499/abstracts/tr482/index.html

instructive to examine US EPA's criteria for classifying a substance as meeting the descriptor "Likely to Be a Carcinogenic to Humans." The Committee claimed that it relied upon the classification criteria identified in the US EPA's 2005 Guidelines for Carcinogen Risk Assessment (the "Guidelines").[10] According to the Guidelines, "This descriptor [Likely to Be Carcinogenic to Humans] is appropriate when the weight of evidence is adequate to demonstrate carcinogenic potential to humans but does not reach the weight of evidence for the descriptor 'Carcinogenic to Humans.'"[11] The Guidelines further state: "Adequate evidence consistent with this descriptor covers a broad spectrum."[12] The Guidelines proceed to provide a number of examples that represent "supporting data for this descriptor." And the Guidelines further state: "The examples below are meant to represent the broad range of data combinations that are covered by this descriptor; they are illustrative and provide neither a checklist nor a limitation for the data that might support use of this descriptor."[13]

In contrast, the Proposition 65 regulations provide highly specific criteria for the determination of "sufficient evidence of carcinogenicity." With respect to animal studies, the Proposition 65 regulations state:

> "Sufficient evidence of carcinogenicity exists from studies in experimental animals. For purposes of this paragraph, 'sufficient evidence' means studies in experimental animals indicate that there is an increased incidence of malignant tumors or combined malignant and benign tumors in multiple species, in multiple experiments (e.g., with different routes of exposure or using different dose

[10] http://www.epa.gov/raf/publications/pdfs/CANCER_GUIDELINES_FINAL_3-25-05.pdf
[11] Id.
[12] Id.
[13] Id.

levels), or, to an unusual degree, in a single experiment with regard to high incidence, site or type of tumor, or age at onset."[14]

Thus, EPA's criteria for the descriptor "Likely to Be Carcinogenic to Humans" and the criteria of "sufficient evidence" under the Proposition 65 regulations are not identical. Therefore, OEHHA is required to carefully evaluate the data on furfuryl alcohol relied upon by the CARC to determine whether it meets the "sufficient evidence" criteria of Section 25306(e)(2), as discussed in greater detail in later sections of this submission.

US EPA provides additional clarification on the meaning of the descriptor "Likely to Be Carcinogenic to Humans." The Guidelines state: "Although the term 'likely' can have a probabilistic connotation in other contexts, its use as a weight of evidence descriptor does not correspond to a quantifiable probability of whether a chemical is carcinogenic. This is because the data that support cancer assessments generally are not suitable for numerical calculations of the probability that an agent is a carcinogen."[15] This raises the possibility that US EPA may describe a substance as "Likely to Be Carcinogenic to Humans" when the probability that it is carcinogenic to humans is low. If listed, such a substance might be required to carry a warning that it is "known to the State of California to cause cancer" when, in fact, there is only a low probability that it causes cancer.

We are aware OEHHA has maintained that conflicting opinions of authoritative bodies do not matter as long as one authoritative body "formally identifies" a substance "as causing cancer." However, OEHHA should be cautious about listing a chemical

[14] 27 CCR 25306(e)(2)
[15] http://www.epa.gov/raf/publications/pdfs/CANCER_GUIDELINES_FINAL_3-25-05.pdf

based on the statement in a CARC Report about a study conducted by another authoritative body, which has concluded that the evidence from its study is inadequate to meet the "sufficient evidence" criteria. One would think that the authoritative body that conducted the study would be in the best position to interpret the results of its own study. This is especially true for an NTP cancer bioassay, since the review process at NTP includes a more thorough and rigorous overall evaluation and a more extensive internal and external peer-review of its own study than does the CARC.

IV. The CARC did not rely on a sufficient amount of data to conclude that furfuryl alcohol causes rare malignant and combined malignant and benign kidney tumors in male mice.

According to the OEHHA Notice, "OEHHA is relying on US EPA's discussion of data and conclusions in the report that furfuryl alcohol causes cancer. Evidence described in the report includes studies showing that furfuryl alcohol increases the incidence of rare nasal epithelial squamous cell carcinomas and combined nasal epithelial carcinomas and epithelial squamous cell carcinomas in male rats, and rare renal carcinomas and combined carcinomas and adenomas in male mice."[16] The Notice concludes: "Thus, US EPA (2014) has found that furfuryl alcohol causes increased incidences of rare malignant nasal tumors in male rats, and rare malignant and combined malignant and benign kidney tumors in male mice."[17]

According to the CARC Report, "There were statistically significant increases for renal adenomas (6%; trend at $p \leq 0.01$), carcinomas (4%), and combined adenomas/carcinomas (10% at $p \leq 0.05$) at the high dose when compared to controls

[16] OEHHA (2015) Notice of Intent to List Furfuryl Alcohol. July 31, 2015.
[17] Id.

(0%)." However, the CARC Report did not describe the unusual procedures that were used to evaluate the kidneys for tumors.

Initially, the kidneys were examined using single sections, i.e., the standard evaluation in NTP cancer bioassays. The standard evaluation of the kidneys revealed no statistically significant increase in adenomas, carcinomas or combined adenomas or carcinomas at any dose level.[18]

Subsequent to the standard evaluation, NTP performed an "extended evaluation" which consisted of making step sections through the kidneys in order to look for tumors that might have been missed by the single section evaluation. According to the NTP, "Kidney step sections provide approximately eight additional sections per animal that may have additional proliferative lesions."[19] Like the standard evaluation, the results of the extended evaluation revealed no statistically significant increase in adenomas, carcinomas, or combined adenomas or carcinomas at any dose level.[20]

Finally, NTP combined the results of the standard evaluation with the results of the extended evaluation. By making this combination, the NTP reported a statistically significant ($p= 0.036$) increase in adenoma or carcinoma combined (but not adenoma alone or carcinoma alone) at the high dose only.[21]

The total number of pair-wise statistical comparisons for adenomas, carcinomas or combined adenomas or carcinomas of the kidney, given three dose levels and three combinations of evaluation methods, was 27. With the selected p value of $p<0.05$, a

[18] NTP TR-482, Table 18, p. 54
[19] Id.
[20] Id.
[21] Id.

false positive rate of 1 out of 20 is considered to be acceptable. In other words, with 27 pair-wise statistical comparisons of the male mouse kidney tumor data, more than one statistically significant difference from controls would be expected due to chance alone. In fact, only one statistically significant difference was observed among the 27 pair-wise statistical comparisons of the kidney tumor data in the NTP cancer bioassay. This raises doubt about whether the one difference observed among the 27 different pair-wise differences is due to treatment with furfuryl alcohol or simply due to chance.

There is no indication that the CARC was aware of or took into consideration the different results obtained with the different evaluation methods (i.e., the standard evaluation, the extended evaluation, and the combined standard and extended evaluations). Nor is there any evidence that the CARC considered the possibility that the only statistically significant pair-wise increase in kidney tumors observed was due to chance given the fact that 27 pair-wise comparisons of kidney tumor data were made. Apparently, this information was not considered by the CARC in its evaluation of the kidney tumor data in male mice. In contrast, NTP concluded that there was no clear evidence of carcinogenic activity in its evaluation of the male mouse kidney tumor data.

US EPA noted "kidney tumors are rare among historical controls and the incidences of the combined tumors in this study (10%) were 25-fold higher than the historical control incidence (0.4%)."[22] However, this reveals that the authors of the CARC Report did not understand that the methods of kidney evaluation in the furfuryl alcohol study are atypical of the kidney evaluation employed in most NTP cancer bioassays. In the furfuryl alcohol cancer bioassay, both standard and extended

[22] US EPA (2014) CARC Report, p. 5.

evaluations of the kidneys were performed. However, it is not NTP's usual practice to conduct extended evaluations (step sections) of the kidneys in its cancer bioassays. In fact, the vast majority of the studies in NTP's historical database included only a single section and did not include the 8 additional sections typically provided by the step sections. Therefore, the CARC's comparison of the 10% incidence of kidney tumors with single and step sections at the high dose cannot be compared directly against the results of a historical control database that did not use the same rigorous procedures. Unlike the CARC, NTP recognized this important distinction, and when NTP compared the kidney tumors results from its furfuryl alcohol cancer bioassay against the historical controls, it compared only the standard evaluation (single section) results against the historical controls, since the historical control studies used single section evaluations.[23] Of note, NTP concluded that furfuryl alcohol produced only "some evidence of carcinogenic activity" in male mice based on the kidney tumor data from its own cancer bioassay.

If there is no increase in kidney tumors in male mice attributable to furfuryl alcohol, the only other tumor type considered to be increased by the CARC is nasal tumors in male rats. In the absence of any other tumor type, an increase in nasal tumors resulting from inhalation exposure to furfuryl alcohol would strongly suggest a direct local effect of furfuryl alcohol on the nasal tissues. Such a local effect at the site of entry would be consistent with a carcinogen that is route-specific (i.e., carcinogenic by inhalation only). However, in fact, the nasal tumor data in male rats do not provide sufficient evidence to conclude that furfuryl alcohol causes cancer, as discussed in the

[23] NTP (1999) TR-482,Table 18, p. 54

next two sections. If OEHHA concludes otherwise, OEHHA should only list furfuryl alcohol via the inhalation pathway.

V. US EPA did not conclude that furfuryl alcohol causes "rare nasal epithelial squamous cell carcinomas and combined nasal epithelial carcinomas and epithelial squamous cell carcinomas in male rats."

The OEHHA Notice states: "Evidence described in the report includes studies showing that furfuryl alcohol increases the incidence of rare nasal epithelial squamous cell carcinomas and combined nasal epithelial carcinomas and epithelial squamous cell carcinomas in male rats …" In comparison, the actual description of the male rat nasal tumors attributed to furfuryl alcohol in the CARC Report is slightly different: "Treatment-related nasal tumors (adenomas, carcinomas, and/or squamous cell carcinomas observed in male rats.; [sic]" In fact, the CARC Report never describes the nasal tumors in male rats in the furfuryl alcohol bioassay as "rare" tumors. This distinction is important because the Proposition 65 regulations indicate that the criteria for "sufficient evidence" in animals may be met if there is an increased incidence "to an unusual degree, in a single experiment with regard to high incidence, site or type of tumor, or age at onset."[24] The CARC Report did not state that the nasal tumors in male mice are rare or unusual with respect to high incidence, site or type of tumor. OEHHA has provided no scientific data that would support the proposition that these tumors are rare, a conclusion that neither US EPA nor NTP made.

The issue of the historical control data on male rat nasal tumors arose during the peer review of the NTP cancer bioassay of furfuryl alcohol by the NTP's Board of

[24] Section 25306(e)(2)

Scientific Counselors Technical Reports Review Subcommittee.[25] Dr. Joseph Haseman, one of the authors of the NTP furfuryl alcohol cancer bioassay said that although there were no squamous cell carcinomas of the nose in the chamber control groups for inhalation studies, there have been one or two in some control groups in other concurrent studies.[26]

VI. The CARC did not rely on a sufficient amount of data to conclude that furfuryl alcohol causes nasal tumors in male rats because it combined histologically different types of nasal tumors.

There is a scientific issue regarding whether it is appropriate to combine nasal epithelial adenomas, epithelial carcinomas, and squamous cell carcinomas. Squamous cell carcinoma is a histologically distinct form of cancer. It arises from the uncontrolled multiplication of cells of epithelium, or cells showing particular cytological or tissue architectural characteristics of squamous cell differentiation, such as the presence of keratin, tonofilament bundles, or desmosomes, structures involved in cell-to-cell adhesion. Usually tumors are combined when they are within the same family. For example, it is appropriate to combine adenomas and carcinomas when the adenomas have the potential to progress to carcinomas of the same origin. In the case of the furfuryl alcohol bioassay, there is no evidence in the record that epithelial carcinomas and squamous cell tumors have a common histological origin. Accordingly, these tumors should not be combined. OEHHA presented no analysis of this issue, nor did US EPA.

The issue of the appropriateness of combining epithelial carcinomas and squamous cell carcinomas is important because the combined incidence was barely

[25] NTP. TR-482. p. 11.
[26] Id.

statistically significant (p=0.044) in male rats at the high dose level in the NTP cancer bioassay. Neither the incidence of epithelial carcinomas nor the incidence of squamous cell carcinomas was statistically significantly increased compared to controls at any dose level in the NTP cancer bioassay. Only by combining these two different types of carcinomas was it possible to demonstrate a statistically significant effect. There is no indication in the CARC Report whether the histological difference in the two types of carcinomas was considered.

VII. The CARC did not rely on a sufficient amount of data to conclude that furfuryl alcohol causes nasal tumors in male rats because it did not consider the role of excessive toxicity (i.e., no surviving males at the end of the study at the high dose).

One of the critical requirements of scientifically valid carcinogenicity testing in rodents is the proper selection of dose levels. In male rats, the high dose level of furfuryl alcohol exceeded the Maximum Tolerated Dose (MTD). None of the male rats exposed to the highest concentration of furfuryl alcohol (32 ppm) survived until the end of the study. Clearly, a high dose associated with 100% mortality before the end of the study represents an excessively high dose. Thus, the only evidence of carcinogenicity in rats administered furfuryl alcohol was observed at an inappropriate dose level that exceeded the MTD.

Remarkably, the CARC Report states: “The highest dose tested was considered to be adequate, but not excessive, in both sexes to assess the carcinogenic potential for furfuryl alcohol. … Although there was 100% mortality at the high dose in the main study, the CARC did not consider this concentration to be excessive, since an adequate number of rats were available for data evaluation.” While it is true that an adequate number of male rats survived for a sufficient amount of time for tumor development to

occur, it is also important to avoid choosing dose levels that exceed the MTD because excessively high doses may result in tumor effects that are secondary to the toxicity rather than directly attributable to the agent. US EPA (2005) has provided guidance on this very point, which seems to have been ignored by the CARC.

The U.S. EPA 2005 Guidelines for Carcinogen Risk Assessment (U.S. EPA Guidelines) address the issue of proper dose selection in cancer bioassays:

> "Among the many criteria for technical adequacy of animal carcinogenicity studies is the appropriateness of the dose selection."[27]

> "Interpretation of carcinogenicity study results is profoundly affected by study exposure conditions, especially by inappropriate dose selection."[28]

The U.S. EPA Guidelines also indicate that increases in tumors seen at excessively high doses may not be directly attributable to the test substance:

> "In addition, overt toxicity or qualitatively altered toxicokinetics due to excessively high doses may result in tumor effects that are secondary to the toxicity rather than directly attributable to the agent."[29]

The U.S. EPA Guidelines also describe an adequate high dose:

> "With regard to the appropriateness of the high dose, an adequate high dose would generally be one that produces some toxic effects without

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[27] U.S. EPA (2005) Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F. March, 2005, p. 2-16.
[28] *Id*.
[29] *Id*. at 2-16 and 2-17

unduly affecting mortality from effects other than cancer or producing significant adverse effect on the nutrition and health of the test animals."[30]

Given the degree of mortality observed among the high-dose male rats, the increase in nasal tumors (combined adenoma, carcinoma and squamous cell carcinoma) observed at this dose cannot be considered relevant to cancer hazard identification. It is highly irregular to rely upon the results of a rat cancer bioassay for purposes of hazard identification when the only dose associated with an increase in tumors caused such severe toxicity that no animals survived to the end of the study.

VIII. Conclusion

OEHHA should not list furfuryl alcohol as a carcinogen under Proposition 65. When examined closely, there is not "sufficient evidence" of carcinogenicity of furfuryl alcohol to list this chemical through the authoritative bodies process. In addition, the authoritative body has not "formally identified" furfuryl alcohol as causing cancer. FEMA requests the opportunity to meet with OEHHA to discuss this matter further after OEHHA has had an opportunity to review the information presented above.

Attachments: (1) October 2, 2014 document from OPP "Chemicals Evaluated for Carcinogenic Potential," and (2) "Evaluating Pesticides for Carcinogenic Potential" document from EPA's web site, last updated 5/9/2012.

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[30] *Id*. at 2-17

http://www.epa.gov/pesticides/health/cancerfs.htm
Last updated on 5/9/2012

Pesticides: Health and Safety

You are here: EPA Home Pesticides Health and Safety Human Health Issues Evaluating Pesticides for Carcinogenic Potential

Evaluating Pesticides for Carcinogenic Potential

This page discusses how EPA reviews pesticides for potential carcinogenicity and explains the Agency's guidelines for evaluating a chemical's potential carcinogenicity. EPA's guidelines have been updated over the years to reflect increased understanding of ways chemicals may cause cancer.

1. How does EPA review pesticides for potential carcinogenicity?
2. What factors does EPA consider in its review of cancer risk?
3. When does EPA review pesticides for potential carcinogenicity?
4. Why are there several different cancer classifications?
5. How have the guidelines changed?
6. How do the different designations compare?

Carcinogenicity classification of pesticides: derivation and definition of terms:

- 2005 classification
- 1999 draft classification
- 1996 classification
- 1986 classification

1. How does EPA review pesticides for potential carcinogenicity?

The Health Effects Division of the Office of Pesticide Programs performs an independent review of studies conducted in mice and rats to evaluate the carcinogenic potential of pesticides. The results of the independent review are peer-reviewed by the Cancer Assessment Review Committee. This committee recommends a cancer classification. The classification will determine how the Agency regulates the pesticide and will include methods for quantification of human risk. In some cases, EPA also requests review by the FIFRA Scientific Advisory Panel. For some chemicals, other groups of EPA scientists have provided the assessment, and OPP uses these assessments.

2. What factors does EPA consider in its review of cancer risk?

When assessing possible cancer risk posed by a pesticide, EPA considers how strongly carcinogenic the chemical is (its potency) and the potential for human exposure. The pesticides are evaluated not only to determine if they cause cancer in laboratory animals, but also as to their potential to cause human cancer. For any pesticide classified as a potential carcinogen, the risk would depend on the extent to which a person might be exposed (how much time and to what quantity of the pesticide). The factors considered include short-term studies, long-term cancer studies, mutagenicity studies, and structure activity concerns. (The term "weight-of-the-evidence" is used in referring to such a review. This means that the recommendation is not based on the results of one study, but on the results of all studies that are available.)

3. When does EPA review pesticides for potential carcinogenicity?

EPA reviews studies submitted when a pesticide is proposed for registration. Studies are

required in two species (mice and rats) and two sexes (males and females). These studies are required for all pesticides used on food and some non-food pesticides that could lead to long-term exposures in humans. These studies may be reviewed again when a pesticide undergoes reregistration and the cancer classification may be re-evaluated, particularly if new studies have been submitted.

4. Why are there several different cancer classifications in the list?

EPA's guidelines for evaluating the potential carcinogenicity of chemicals have been updated over the years to reflect increased understanding of ways chemicals may cause cancer. The current guidelines call for greater emphasis on characterization discussions for hazard, dose-response assessment, exposure assessment, and risk characterization, as well as the use of mode of action in the assessment of potential carcinogenesis. EPA does not have the resources to re-evaluate every chemical to determine how it would be described under new guidelines, and there is no reason to re-evaluate chemicals unless there is some new information that could change the basic understanding of that chemical.

5. How have the guidelines changed?

EPA issued its first set of principles to guide evaluation of human cancer potential in1976. In 1986, EPA issued updated guidance, which included a letter system (A-E) for designating degree of carcinogenic potential. In the 1986 guidelines, hazard identification and the weight-of-evidence process focused on tumor findings. The human carcinogenic potential of agents was characterized by a six-category alphanumeric classification system (A, B1, B2, C, D, and E).

In 1996, EPA released "Proposed Guidelines for Carcinogen Risk Assessment," which used descriptive phrases rather than the alphanumeric classification to classify carcinogenic potential. In the 1996 classification structure, increased emphasis was placed on discussing characterization of hazard, dose-response, and exposure assessments. The hazard and weight of evidence process embraced an analysis of all relevant biological information and emphasized understanding the agent's mode of action in producing tumors to reduce the uncertainty in describing the likelihood of harm.

By 1999, the science related to carcinogens had advanced significantly. EPA issued draft guidelines that continued the greater emphasis on characterization discussions for hazard, dose-response assessment, exposure assessment, risk characterization and the use of mode of action in the assessment of potential carcinogenesis. In addition, the guidelines included consideration of risk to children, as well as addressing other issues such as nuances related to the amount and adequacy of data on a chemical.

In March, 2005, EPA released its final *Guidelines for Carcinogen Risk Assessment* (EPA/630/P-03/001B). These guidelines represent the culmination of a long development process, replacing EPA's original cancer risk assessment guidelines (1986) and its interim final guidelines (1999).

6. How do the different designations compare?

The short answer is that they cannot be directly compared. Each system's designations refer to the reviews and criteria it contains. A substance that is, for example, a "C" in the 1986 system may not be directly translatable to any particular category in the later systems. The designation for any substance must be considered in the context of the system under which it was reviewed.

A list of the descriptors from the various classification systems and their definitions follows.

Carcinogenicity Classification of Pesticides: Derivation and Definition of Terms

2005 classification

The following descriptors from the 2005 Guidelines for Carcinogen Risk Assessment can be used as an introduction to the weight of evidence narrative in the cancer risk assessment. The examples presented in the discussion of the descriptors are illustrative. The examples are neither a checklist nor a limitation for the descriptor. The complete weight of evidence narrative, rather than the descriptor alone, provides the conclusions and the basis for them.

Carcinogenic to humans. This descriptor indicates strong evidence of human carcinogenicity. It covers different combinations of evidence.

- This descriptor is appropriate when there is convincing epidemiologic evidence of a causal association between human exposure and cancer.
- Exceptionally, this descriptor may be equally appropriate with a lesser weight of epidemiologic evidence that is strengthened by other lines of evidence. It can be used when <u>all</u> of the following conditions are met:
    - (a) there is strong evidence of an association between human exposure and either cancer or the key precursor events of the agent's mode of action but not enough for a causal association, *and*
    - (b) there is extensive evidence of carcinogenicity in animals, *and*
    - (c) the mode(s) of carcinogenic action and associated key precursor events have been identified in animals, *and*
    - (d) there is strong evidence that the key precursor events that precede the cancer response in animals are anticipated to occur in humans and progress to tumors, based on available biological information.

In this case, the narrative includes a summary of both the experimental and epidemiologic information on mode of action and also an indication of the relative weight that each source of information carries, e.g., based on human information, based on limited human and extensive animal experiments.

Likely to be carcinogenic to humans. This descriptor is appropriate when the weight of the evidence is adequate to demonstrate carcinogenic potential to humans but does not reach the weight of evidence for the descriptor "Carcinogenic to Humans." Adequate evidence consistent with this descriptor covers a broad spectrum. As stated previously, the use of the term "likely"as a weight of evidence descriptor does not correspond to a quantifiable probability. The examples below are meant to represent the broad range of data combinations that are covered by this descriptor; they are illustrative and provide neither a checklist nor a limitation for the data that might support use of this descriptor. Moreover, additional information, e.g., on mode of action, might change the choice of descriptor for the illustrated examples. Supporting data for this descriptor may include:

- an agent demonstrating a plausible (but not definitively causal) association between human exposure and cancer, in most cases with some supporting biological, experimental evidence, though not necessarily carcinogenicity data from animal experiments;
- an agent that has tested positive in animal experiments in more than one species, sex, strain, site, or exposure route, with or without evidence of carcinogenicity in humans;
- a positive tumor study that raises additional biological concerns beyond that of a statistically significant result, for example, a high degree of malignancy, or an early age at onset;
- a rare animal tumor response in a single experiment that is assumed to be relevant to humans; or
- a positive tumor study that is strengthened by other lines of evidence, for example, either plausible (but not definitively causal) association between human exposure and

cancer or evidence that the agent or an important metabolite causes events generally known to be associated with tumor formation (such as DNA reactivity or effects on cell growth control) likely to be related to the tumor response in this case.

Suggestive evidence of carcinogenic potential. This descriptor of the database is appropriate when the weight of evidence is suggestive of carcinogenicity; a concern for potential carcinogenic effects in humans is raised, but the data are judged not sufficient for a stronger conclusion. This descriptor covers a spectrum of evidence associated with varying levels of concern for carcinogenicity, ranging from a positive cancer result in the only study on an agent to a single positive cancer result in an extensive database that includes negative studies in other species. Depending on the extent of the database, additional studies may or may not provide further insights. Some examples include:

- a small, and possibly not statistically significant, increase in tumor incidence observed in a single animal or human study that does not reach the weight of evidence for the descriptor "Likely to Be Carcinogenic to Humans." The study generally would not be contradicted by other studies of equal quality in the same population group or experimental system (see discussions of *conflicting evidence* and *differing results*, below);
- a small increase in a tumor with a high background rate in that sex and strain, when there is some but insufficient evidence that the observed tumors may be due to intrinsic factors that cause background tumors and not due to the agent being assessed. (When there is a high background rate of a specific tumor in animals of a particular sex and strain, then there may be biological factors operating independently of the agent being assessed that could be responsible for the development of the observed tumors.) In this case, the reasons for determining that the tumors are not due to the agent are explained;
- evidence of a positive response in a study whose power, design, or conduct limits the ability to draw a confident conclusion (but does not make the study fatally flawed), but where the carcinogenic potential is strengthened by other lines of evidence (such as structure-activity relationships); or
- a statistically significant increase at one dose only, but no significant response at the other doses and no overall trend.

Inadequate information to assess carcinogenic potential. This descriptor of the database is appropriate when available data are judged inadequate for applying one of the other descriptors. Additional studies generally would be expected to provide further insights. Some examples include:

- little or no pertinent information;
- conflicting evidence--that is--some studies provide evidence of carcinogenicity but other studies of equal quality in the same sex and strain are negative. Differing results, that is, positive results in some studies and negative results in one or more different experimental systems, do not constitute *conflicting evidence,* as the term is used here. Depending on the overall weight of evidence, differing results can be considered either suggestive evidence or likely evidence; or
- negative results that are not sufficiently robust for the descriptor, "Not Likely to Be Carcinogenic to Humans."

Not likely to be carcinogenic to humans. This descriptor is appropriate when the available data are considered robust for deciding that there is no basis for human hazard concern. In some instances, there can be positive results in experimental animals when there is strong, consistent evidence that each mode of action in experimental animals does not operate in humans. In other cases, there can be convincing evidence in both humans and animals that the agent is not carcinogenic. The judgment may be based on data such as:

- animal evidence that demonstrates lack of carcinogenic effect in both sexes in well-designed and well-conducted studies in at least two appropriate animal species (in the absence of other animal or human data suggesting a potential for cancer effects),
- convincing and extensive experimental evidence showing that the only carcinogenic effects observed in animals are not relevant to humans,
- convincing evidence that carcinogenic effects are not likely by a particular exposure route (see Section 2.3), or
- convincing evidence that carcinogenic effects are not likely below a defined dose range.

A descriptor of "not likely" applies only to the circumstances supported by the data. For example, an agent may be "Not Likely to Be Carcinogenic" by one route but not necessarily by

another. In those cases that have positive animal experiment(s) but the results are judged to be not relevant to humans, the narrative discusses why the results are not relevant.

Multiple descriptors. More than one descriptor can be used when an agent's effects differ by dose or exposure route. For example, an agent may be "Carcinogenic to Humans" by one exposure route but "Not Likely to Be Carcinogenic" by a route by which it is not absorbed. Also, an agent could be "Likely to Be Carcinogenic" above a specified dose but "Not Likely to Be Carcinogenic" below that dose because a key event in tumor formation does not occur below that dose.

1999 draft classification

The terms used to describe carcinogenic potential in the July 1999 "Review Draft of the Guidelines for Carcinogen Risk Assessment" are listed and defined as follows:

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 keys 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 judgment

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-2-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.

1996 classification

In April 1996, EPA released the "Proposed Guidelines for Carcinogen Risk Assessment." This scheme varied from the earlier 1986 scheme in that it used descriptors rather than letters to classify carcinogenic potential. The descriptors 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.

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.

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).

1986 classification

The following cancer classification scheme was first introduced in 1986. It was used until 1996.

Group A - Human carcinogen. This group is used only when there is sufficient evidence from epidemiologic studies to support a causal association between exposure to the agents and cancer.

Group B - Probable human carcinogen. This group includes agents for which the weight of evidence of human carcinogenicity based on epidemiologic studies is "limited" and also includes agents for which the weight of evidence of carcinogenicity based on animal studies is "sufficient." The group is divided into two subgroups.

Group B1 is reserved for agents for which there is limited evidence of carcinogenicity from epidemiologic studies.
Group B2 is used for Agents for which there is "sufficient: evidence from animal studies and for which there is "inadequate evidence" or "no data" from epidemiologic studies.

Group C - Possible human carcinogen. This group is used for agents with limited evidence of carcinogenicity in animals in the absence of human data.

Group D - Not classifiables as to human carcinogenicity. This group is generally used for agents with inadequate human and animal evidence of carcinogenicity or for which no data are

available.

Group E - Evidence of non-carcinogenicity for humans. This group is used for agents that show no evidence for carcinogenicity in at least two adequate animal tests in different species or in both adequate epidemiologic and animal studies.

October 2, 2014

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BACKGROUND

What is this list?

The following list provides an overview of pesticide chemicals evaluated for carcinogenic potential by EPA's Pesticide Program through October 2012. The evaluation of many of these chemicals is an ongoing process. Therefore, the information in this list may be subject to change as new and/or additional data are submitted to EPA. This list will be updated annually.

How should the information provided in this list be used?

Although this list is available to the public, note that the list represents only the potential carcinogenicity hazard for the chemical with no consideration of exposure information. This list is not intended to be used independent of the full risk assessment for the chemical. When EPA completes a risk assessment on a pesticide, a variety of toxicity information, including potential for noncancer effects (e.g., neurotoxicity, developmental and reproductive toxicity, immunotoxicity, etc) and carcinogenicity, are considered in determining whether to register a pesticide and what requirements for use of the pesticide need to be in place to protect human health. The simple fact of being listed here does not imply that the pesticide poses a significant cancer hazard to the public from use

What does the report date mean?

The date included in the list for each chemical is the date of the most recent review of potential carcinogenicity hazard for that chemical. This date provides a key as to which set of cancer guidelines were used in the review. Note that the classification of potential carcinogenicity generally is not reevaluated unless new data are submitted.

How does EPA review pesticides for potential carcinogenicity?

In evaluating and describing the potential carcinogenicity of a pesticide, EPA's Pesticide Program follows the Agency's Guidelines for Carcinogen Risk Assessment (see http://epa.gov/cancerguidelines/ for more information). The Health Effects Division of the Pesticide Program performs an independent review of all the available evidence to determine the carcinogenic potential of pesticides.

The results of the independent review are peer-reviewed by the Cancer Assessment Review Committee. This committee recommends a "descriptor" (e.g., likely to be carcinogenic to humans, not likely to be carcinogenic to humans, suggestive evidence of carcinogenic potential) to convey the cancer hazard potential of the compound. This descriptor is also referred to as the cancer classification. The evidence for the human cancer potential and the extent to which a person might be exposed (how much time and to what quantity of the pesticide) will determine how the Agency regulates the pesticide. In some cases, EPA may request a review by the FIFRA Scientific Advisory Panel.

What does EPA consider in its review of cancer risk?
In determining the cancer-causing potential of a chemical, EPA considers the full range of available evidence. This information includes

- laboratory animal findings,
- metabolism studies,
- structural relationships with other carcinogens, and
- if available, mode of carcinogenic action information and epidemiologic findings in humans.

All of the information is considered in a weight-of-the-evidence approach. In this weight-of-evidence evaluation, EPA undertakes a critical analysis of each available study to determine its quality and reliability. Then the entire body of evidence is integrated and examined for consistency (repeatability of findings in studies), cohesiveness (a logical pattern of responses), and for biological plausibility (i.e., are the observed findings consistent with current understanding of carcinogenic processes). How the Agency determines the cancer potential of a compound can be found at: http://epa.gov/cancerguidelines/

Most of the cancer determinations for pesticides are largely based on laboratory animal studies because, under its statutory authority, EPA requires registrants to submit an extensive range of laboratory studies on pesticides including long-term rodent cancer studies (http://www.epa.gov/pesticides/regulating/data_requirements.htm). The findings in laboratory animals are generally assumed to be relevant to humans unless there is evidence to the contrary. When human information is available, EPA would consider that information (for example see http://www.epa.gov/pesticides/health/ag-health.html.)

When does EPA review pesticides for potential carcinogenicity?
EPA reviews studies submitted when a pesticide is proposed for registration. Studies are required in two species (mice and rats) and two sexes (males and females), as well as a battery of mutagenicity assays. These studies are required for all pesticides used on food and some non-food pesticides that could lead to long-term exposures in humans. In future reviews of the pesticide, the cancer classification may be reevaluated if new studies have been submitted.

All existing pesticide tolerances that were in place as of August 1996 were re-assessed for their human health and environmental risks by August 2006 as required by the Food Quality Protection Act of 1996. However, if there was no new information on carcinogenicity, the compound was not re-evaluated simply to determine how it would be described under the 2005 cancer guidelines.

How have the Agency's cancer assessment guidelines changed?
There have been a number of different documents issued by the Agency for cancer evaluation.

- In 1976, EPA issued its first set of principles and interim procedures to guide evaluation of human cancer potential.
- In 1986, EPA issued guidance, which included a letter system (A-E) for designating degree of carcinogenic potential.
    - In the 1986 guidelines, hazard identification and the weight-of evidence process focused on tumor findings.

    - See http://epa.gov/cancerguidelines/guidelines-carcinogen-risk-assessment-1986.htm for a detailed description of this classification system.
- In 1996, EPA released "Proposed Guidelines for Carcinogen Risk Assessment," which used a weight of evidence narrative and standardized descriptors to replace the 1986 alphanumeric classification to classify carcinogenic potential.
    - In the 1996 proposal, emphasis was placed on available mode of carcinogenic action information and discussing characterization of hazard, dose-response, and exposure assessments.
    - The hazard and weight of evidence process embraced an analysis of all relevant biological information and emphasized understanding the agent's mode of action in producing tumors to reduce the uncertainty in describing the likelihood of harm.
    - See 1996 -http://www.epa.gov/raf/publications/pdfs/propcra_1996.pdf
- In 1999, EPA issued a revised version of its 1996 proposal that responded to public and peer review comments, which included:
    - a framework approach to evaluate the mode of action in the assessment of potential carcinogenesis.
    - See-http://epa.gov/raf/publications/pdfs/CANCER_GLS.PDF
- In March, 2005, EPA released its final *Guidelines for Carcinogen Risk Assessment* (EPA/630/P-03/001B). These guidelines represent the culmination of a long development process, replacing EPA's original cancer risk assessment guidelines (1986) and its interim final guidelines (1999). Key changes included:
    - Five weight of evidence descriptors chosen for use in narratives ("*Carcinogenic to Humans*," "*Likely to Be Carcinogenic to Humans*," "*Suggestive Evidence of Carcinogenic Potential*," "*Inadequate Information to Assess Carcinogenic Potential*," and "*Not Likely to Be Carcinogenic to Humans*.")
    - Emphasis on analysis of data will precede use of defaults
    - Improved guidance on modeling and expanded discussions of sensitive subpopulations including children (supplemental guidance)
    - See http://www.epa.gov/raf/publications/pdfs/CANCER_GUIDELINES_FINAL_3-25-05.PDF

Why are there several different cancer classifications in the list?
As discussed above, EPA's guidelines for evaluating the potential carcinogenicity of chemicals have been updated over the years to reflect increase transparency in describing the cancer potential of a compound and to reflect the understanding of ways chemicals may cause cancer.

Not all pesticides have been evaluated under EPA's 2005 Cancer Guidelines. Agency policy states that for risk assessments that were completed before issuance of the 2005 Guidelines, the need for a re-assessment should be determined on a case-by-case basis by the program and that the existing assessment should continue to be considered scientifically sound based on the guidance used when the assessment was completed (http://www.epa.gov/raf/publications/pdfs/2005_cancer_guidelines_mem.pdf)

How can I find the basis of EPA's decision regarding the carcinogenicity of a pesticide?
The Reregistration Eligibility Decision for each pesticide contains a discussion of the available data and information used in the human health and environmental risk assessments, which includes a description of the evidence used to determine the cancer potential of the chemical. Also, the Cancer Assessment Review Committee report is available by requesting it through the Freedom of Information Act (FOIA) (link to http://www.epa.gov/pesticides/foia/).

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CHEMICAL	CAS NO.*	PC CODE**	CANCER CLASSIFICATION***	REPORT DATE****
1,3-Dibromo-5,5-dimethylhydantoin	77-48-5	006317	Not Likely To Be Carcinogenic To Humans	8/28/2000
1,3-dichloro-5-methylhydantoin	89415-87-2	128826	Not Likely to Be Carcinogenic to Humans	8/28/2000
2, 4 - DBA	94-82-6	030801	Not Likely to Be Carcinogenic to Humans	6/13/2003
2,4-D + Salts & Esters	94-75-7	030001	Group D--Not Classifiable as to Human Carcinogenicity	1/29/1997
2,4-D Choline	1048373-72-3	051505	Group D--Not Classifiable As To Human Carcinogenicity	10/27/2011
2-Benzyl-4-chlorophenol	120-32-1	062201	Group C--Possible Human Carcinogen	9/5/1995
4-aminopyridine	504-24-5	069201	Group D--Not Classifiable As To Human Carcinogenicity	8/6/2007
Acephate	30560-19-1	103301	Group C--Possible Human Carcinogen	5/8/1985
Acequinocyl	57960-19-7	006329	Not Likely to Be Carcinogenic to Humans	11/13/2003
Acetamide	63114-77-2	111101	Group C--Possible Human Carcinogen	5/29/1990
Acetamiprid	135410-20-7	099050	Not Likely to Be Carcinogenic to Humans	12/11/2001
Acetochlor	34256-82-1	121601	Suggestive Evidence of Carcinogenic Potential	1/3/2007
Acibenzolar-S-methyl	135158-54-2	061402	Not Likely to Be Carcinogenic to Humans	12/9/1999
Acifluorfen sodium	62476-59-9	114402	Likely to be Carcinogenic to Humans at High Doses Not Likely to be Carcinogenic to Humans at Low Doses	7/9/2003

For information about future review of these pesticides, see the Registration Review schedule/status at http://www2.epa.gov/pesticide-reevaluation

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CHEMICAL	CAS NO.*	PC CODE**	CANCER CLASSIFICATION***	REPORT DATE****
Acrinathrin	101007-06-1	129141	Group D--Not Classifiable as to Human Carcinogenicity	7/15/1996
ADBAC	68424-85-1	069105	Not Likely to Be Carcinogenic to Humans	12/8/1999
Alachlor	15972-60-8	090501	Likely to be Carcinogenic to Humans (High Doses); Not Likely to be Carcinogenic to Humans (Low Doses)	6/27/1997
Aldicarb	116-06-3	098301	Group E--Evidence of Non-carcinogenicity for Humans	7/17/2002
Alpha-Cypermethrin	67375-30-8	209600	Group C--Possible Human Carcinogen	09/11/12
Ametryn	834-12-8	080801	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	9/17/2004
Amicarbazone	129909-90-6	114004	Not Likely To Be Carcinogenic To Humans	8/10/2005
Aminocyclopyrachlor	858956-08-8, 858956-35-1, 858954-83-3, 124423-84-3, 1759-53-1	288008	Not Likely To Be Carcinogenic To Humans	11/9/2011
Aminopyralid	150114-71-9	005100	Not Likely To Be Carcinogenic To Humans	7/12/2005
Amisulbrom	348635-87-0	016330	Suggestive Evidence Of Carcinogenic Potential	12/2/2010
Amitraz	33089-61-1	106201	Suggestive Evidence of Carcinogenic Potential	7/18/2006
Amitrole	61-82-5	004401	Not Likely To Be Carcinogenic To Humans At Doses That Do Not Alter Rat Thyroid Hormone Homeostasis	5/11/2006
Anthraquinone	84-65-1	122701	Likely To Be Carcinogenic To Humans	10/31/12

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CHEMICAL	CAS NO.*	PC CODE**	CANCER CLASSIFICATION***	REPORT DATE****
Aquashade	2650-18-2	110301	Not Likely To Be Carcinogenic To Humans	9/27/2005
Asulam	3337-71-1	106901	Group C--Possible Human Carcinogen	12/6/2001
Atrazine	1912-24-9	080803	Not Likely to be Carcinogenic to Humans	12/13/2000
Avermectin (see Emamectin Benzoate)	65195-55-3	122804	Group E--Evidence of Non-carcinogenicity for humans	6/27/1996
Azafenidin	68049-83-2	119016	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	10/18/1999
Azinphos-methyl	86-50-0	058001	Not Likely to Be Carcinogenic to Humans	4/20/1998
Azoxystrobin	131860-33-8	128810	Not Likely to Be Carcinogenic to Humans	1/14/1997
Bendiocarb	22781-23-3	105201	Group E--Evidence of Non-carcinogenicity for Humans	12/16/1997
Benfluralin	1861-40-1	084301	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	12/27/2001
Benomyl	17804-35-2	099101	Group C--Possible Human Carcinogen	9/21/2000
Bensulide	741-58-2	009801	Not Likely to Be Carcinogenic to Humans	6/10/1999
Bentazon	25057-89-0	275200	Group E--Evidence of Non-carcinogenicity for Humans	1/14/1992
Benthiavalicarb-isopropyl	177406-68-7	098379	Likely to be Carcinogenic to Humans	10/18/2005
Benzyl Benzoate	120-51-4	009501	Not Likely To Be Carcinogenic To Humans	6/28/2007
Beta Cyfluthrin	68359-37-5	118831	Not Likely To Be Carcinogenic To Humans	1/27/2010
Bifenazate	149877-41-8	000586	Not Likely to Be Carcinogenic to Humans	8/28/2001
Bifenthrin	82657-04-3	128825	Group C--Possible Human Carcinogen	2/19/2003

For information about future review of these pesticides, see the Registration Review schedule/status at http://www2.epa.gov/pesticide-reevaluation

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CHEMICAL	CAS NO.*	PC CODE**	CANCER CLASSIFICATION***	REPORT DATE****
Bioallethrin	584-79-2	004003	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	12/02/2003
Bispyrabac Sodium	125401-92-5	078906	Not Likely to Be Carcinogenic to Humans	8/2/2001
Bitertanol	55179-31-2	117801	Not Likely To Be Carcinogenic To Humans	11/30/2005
Borax	1303-96-4	011102	Group E--Evidence of Non-carcinogenicity for humans	11/24/1993
Boric acid	10043-35-3	011001	Group E--Evidence of Non-carcinogenicity for humans	11/24/1993
Boron	7440-42-8	128945	Group E--Evidence of Non-carcinogenicity for humans	11/24/1993
Boscalid	188425-85-6	128008	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	11/14/2002
Bromacil	314-40-9	012301	Group C--Possible Human Carcinogen	1/13/1993
Bromoxynil	1689-84-5	035301	Group C--Possible Human Carcinogen	03/12/1997
Bromuconazole	116255-48-2	120503	Group E--Evidence of Non-carcinogenicity for humans	4/24/1995
Bronopol	52-51-7	216400	Group E--Evidence of Non-carcinogenicity for humans	6/12/1995
Buprofezin	69327-76-0	275100	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	3/15/2000
Butachlor	23184-66-9	112301	Likely to be Carcinogenic to Humans	2/24/1999
Butafenacil	134605-64-4	122004	Not Likely to Be Carcinogenic to Humans	7/11/2003

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CHEMICAL	CAS NO.*	PC CODE**	CANCER CLASSIFICATION***	REPORT DATE****
Butylate	2008-41-5	041405	Group E--Evidence of Non-carcinogenicity for humans	11/25/1992
Cacodylic acid	75-60-5	012501	Group B--Probable Human Carcinogen	12/14/1999
Cadusafos	95465-99-9	128864	Group E--Evidence of Non-carcinogenicity for humans	5/28/1992
Captafol	2939-80-2	081701	Group B--Probable Human Carcinogen	5/19/1987
Captan	133-06-2	081301	Likely at prolonged, high-level exposures, but not likely at dose levels that do not cause cytotoxicity and regenerative cell hyperplasia	9/22/2004
Carbaryl	63-25-2	056801	Likely to be Carcinogenic to Humans	2/12/2002
Carbendazim (MBC)	10605-21-7	128872	Group C--Possible Human Carcinogen	4/7/1989
Carbofuran	1563-66-2	090601	Not Likely to Be Carcinogenic to Humans	6/17/1997
Carboxin	5234-68-4	090201	Not Likely to Be Carcinogenic to Humans	6/5/2003
Carfentrazone-ethyl	128639-02-1	128712	Not Likely to Be Carcinogenic to Humans	5/16/2001
Chlorantraniliprole	500008-45-7	090100	Not Likely To Be Carcinogenic To Humans	3/4/2009
Chlordimeform	6164-98-3	059701	Group B--Probable Human Carcinogen	12/20/1985
Chlorethoxyfos	54593-83-8	129006	Group D--Not Classifiable as to Human Carcinogenicity	3/9/1995
Chlorfenapyr	122453-73-0	129093	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	3/18/2003

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Chlorflurenol Methyl Ester	2536-31-4	098801	Not Likely To Be Carcinogenic To Humans	7/10/2006
Chlorimuron-ethyl	90982-32-4	128901	Not Likely To Be Carcinogenic To Humans	2/5/2009
Chlormequat chloride	999-81-5	018101	Not Likely To Be Carcinogenic To Humans	6/12/2007
Chloroaniline, p-	106-47-8	017203	Group B--Probable Human Carcinogen	4/27/1995
Chloroneb	2675-77-6	027301	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	12/18/2003
Chloropicrin	76-06-2	081501	Not Likely To Be Carcinogenic To Humans	6/30/2010
Chlorothalonil	1897-45-6	081901	Likely To Be Carcinogenic To Humans	10/20/1997
Chlorpropham	101-21-3	018301	Group E--Evidence of Non-carcinogenicity for humans	10/11/1994
Chlorpyrifos	2921-88-2	059101	Group E--Evidence of Non-carcinogenicity for humans	11/23/1993
Chlorpyrifos methyl	5598-13-0	059102	Not Likely to Be Carcinogenic to Humans	5/17/1999
Chlorsulfuron	64902-72-3	118601	Group E--Evidence of Non-carcinogenicity for humans	7/17/2002
Chlorthal-dimethyl (DCPA)	1861-32-1	078701	Group C--Possible Human Carcinogen	2/10/1995
Clethodim	99129-21-2	121011	Not Likely To Be Carcinogenic To Humans	9/28/2007
Clodinafop-propargyl	105512-06-9	125203	Suggestive Evidence of Carcinogenic Potential	2/8/2006
Clofencet (MON 21200)	82697-71-0	128726	Group C--Possible Human Carcinogen	7/23/1996
Clofentezine	74115-24-5	125501	Group C--Possible Human Carcinogen	4/3/1990
Clomazone	81777-89-1	125401	Not Likely to Be Carcinogenic to Humans	1/31/2001

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Clopyralid	1702-17-6	117403	Not Likely to Be Carcinogenic to Humans	12/20/1999
Cloquintocet-mexyl	99607-70-2	700099	Not Likely to Be Carcinogenic to Humans	8/31/1999
Cloransulam-methyl	147150-35-4	129116	Group E--Evidence of Non-carcinogenicity for humans	9/30/1997
Clothianidin	210880-92-5	044309	Not Likely to Be Carcinogenic to Humans	1/6/2003
CMNP (Pyrazachlor)	6814-58-0	207100	Likely To Be Carcinogenic To Humans	09/20/2011
Cocamide Diethanolamine	68603-42-9	224600	Likely to be Carcinogenic to Humans	10/17/2001
Copper Compounds	20427-59-2	023401	Group D--Not Classifiable As To Human Carcinogenicity	6/13/2006
Coumaphos	56-72-4	036501	Not Likely to Be Carcinogenic to Humans	6/25/1999
Cresol, p-Chloro-m-	59-50-7	064206	Group D--Not Classifiable as to Human Carcinogenicity	11/28/1995
Cryolite	15096-52-3	075101	Group D--Not Classifiable as to Human Carcinogenicity	12/22/1995
Cumyluron	99485-76-4	027902	Suggestive Evidence Of Carcinogenic Potential	6/11/2008
Cyanazine	21725-46-2	100101	Group C--Possible Human Carcinogen	7/30/1991
Cyantraniliprole	736994-63-1	090098	Not Likely To Be Carcinogenic To Humans	03/07/13
Cyazofamid	120116-88-3	085651	Not Likely To Be Carcinogenic To Humans	6/3/2009
Cyclanilide	113136-77-9	026201	Not Likely to Be Carcinogenic to Humans	4/9/1997

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Cycloate	1134-23-2	041301	Not Likely to Be Carcinogenic to Humans	9/25/2003
Cyflufenamid	180409-60-3	555550	Likely To Be Carcinogenic To Humans	6/22/2010
Cyflumetofen	400882-07-7	138831	Suggestive Evidence Of Carcinogenic Potential	12/30/2013
Cyfluthrin	68359-37-5	128831	Not Likely to Be Carcinogenic to Humans	5/21/2002
Cyhalofop-butyl	122008-85-9	082583	Not Likely To Be Carcinogenic To Humans	12/20/2007
Cyhalothrin	68085-85-8	128867	Group D--Not Classifiable as to Human Carcinogenicity	8/25/1993
Cyhexatin	13121-70-5	101601	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	4/7/2005
Cymoxanil	57966-95-7	129106	Not Likely to Be Carcinogenic to Humans	1/2/2003
Cypermethrin	52315-07-8	109702	Group C--Possible Human Carcinogen	9/27/1988
Cyproconazole	94361-06-5	128993	Not Likely To Be Carcinogenic To Humans at doses that do not cause a mitogenic response in the liver	12/4/2007
Cyprodinil	121552-61-2	288202	Not Likely to Be Carcinogenic to Humans	1/14/1998
Cyprosulfamide	221667-31-8	877400	Not Likely To Be Carcinogenic To Humans	2/29/2008
Cyromazine	66215-27-8	121301	Group E--Evidence of Non-carcinogenicity for humans	1/6/1995
Daminozide	1596-84-5	035101	Group B--Probable Human Carcinogen	7/26/1991
Dantochlor (BCDMH)	118-52-5	028501	Not Likely to Be Carcinogenic to Humans	8/14/2000

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Dazomet	533-74-4	035602	Group D--Not Classifiable as to Human Carcinogenicity	12/7/1993
DEET	134-62-3	080301	Group D--Not Classifiable as to Human Carcinogenicity	1/4/1996
Deltamethrin	52918-63-5	097805	Not Likely to Be Carcinogenic to Humans	9/9/2003
Desmedipham	13684-56-5	104801	Group E--Evidence of Non-carcinogenicity for humans	11/20/1995
Diazinon	333-41-5	057801	Not Likely to Be Carcinogenic to Humans	6/17/1997
Dicamba	1918-00-9	029801	Group D--Not Classifiable as to Human Carcinogenicity	7/29/1996
Dichlobenil	1194-65-6	027401	Group C--Possible Human Carcinogen	7/18/1995
Dichlormid	37764-25-3	900497	Not Likely To Be Carcinogenic To Humans	11/15/2005
Dichlorobenzamide, 2,6-	2008-58-4	027402	Group D--Not Classifiable as to Human Carcinogenicity	11/28/1995
Dichlorvos	62-73-7	084001	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	3/1/2000
Diclofop-methyl	51338-27-3	110902	Likely to be Carcinogenic to Humans	5/24/2000
Dicloran	99-30-9	031301	Suggestive Evidence Of Carcinogenic Potential	09/05/2006
Diclosulam	145701-21-9	129122	Not Likely to Be Carcinogenic to Humans	11/9/1999
Dicofol	115-32-2	010501	Group C--Possible Human Carcinogen	6/24/1992

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Dicrotophos	141-66-2	035201	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	10/18/1999
Didecyl dimethyl ammonium chloride (DDAC)	7173-51-5	069149	Group E--Evidence of Non-carcinogenicity for Humans	4/11/2000
Difenoconazole	119446-68-3	128847	Group C--Possible Human Carcinogen	7/27/1994
Difenzoquat methyl sulfate	43222-48-6	106401	Group E--Evidence of Non-carcinogenicity for humans	5/24/1994
Diflubenzuron	35367-38-5	108201	Group E--Evidence of Non-carcinogenicity for humans	4/27/1995
Diflufenzopyr Sodiium	109293-98-3	005107	Not Likely to Be Carcinogenic to Humans	10/6/1998
Dimethenamid	87674-68-8	129051	Group C--Possible Human Carcinogen	9/15/1995
Dimethipin	55290-64-7	118901	Group C--Possible Human Carcinogen	1/5/1990
Dimethoate	60-51-5	035001	Group C--Possible Human Carcinogen	3/26/2002
Dimethomorph	110488-70-5	268800	Not Likely to Be Carcinogenic to Humans	5/13/1998
Dimethoxane	828-00-2	001001	Suggestive Evidence of Carcinogenic Potential	12/21/2000
Dimethyl ether	115-10-6	900382	Group D--Not Classifiable as to Human Carcinogenicity	1/12/1994
Dimethylhydantoin	16079-88-2	006315	Not Likely to Be Carcinogenic to Humans	8/28/2000
Dinocap	39300-45-3	036001	Group E--Evidence of Non-carcinogenicity for Humans	6/22/1994
Dinoseb	88-85-7	037505	Group C--Possible Human Carcinogen	6/19/1986
Dinotefuran	165252-70-0	044312	Not Likely to Be Carcinogenic to Humans	3/5/2004
Diphenylamine	122-39-4	038501	Not Likely to Be Carcinogenic to Humans	4/1/1997

For information about future review of these pesticides, see the Registration Review schedule/status at http://www2.epa.gov/pesticide-reevaluation

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Diquat dibromide	85-00-7	032201	Group E--Evidence of Non-carcinogenicity for Humans	5/12/1994
Disodium methanearsonate	144-21-8	013802	Not Likely to Be Carcinogenic to Humans	7/26/2000
Disulfoton	298-04-4	032501	Group E--Evidence of Non-carcinogenicity for Humans	4/21/1997
Dithianon	3347-22-6	099201	Suggestive Evidence of Carcinogenic Potential	2/23/2006
Dithiopyr (MON 7200)	97886-45-8	128994	Group E--Evidence of Non-carcinogenicity for Humans	5/29/1997
Diuron	330-54-1	035505	Known/Likely	5/8/1997
Dodine	2439-10-3	044301	Not Likely To Be Carcinogenic To Humans	1/24/2008
Ecolyst		069089	Not Likely to Be Carcinogenic to Humans	10/19/1999
Emamectin Benzoate (Deoxy Avermectin)	137512-74-4	122806	Not Likely to Be Carcinogenic to Humans	3/19/1998
Endosulfan	115-29-7	079401	Not Likely to Be Carcinogenic to Humans	1/31/2000
Endothall	145-73-3	038901	Not Likely To Be Carcinogenic To Humans	10/23/2008
Epoxiconazole	106325-08-0, 133855-98-8	123909	Likely to be Carcinogenic to Humans	1/24/2001
Esbiothrin	28434-00-6	004007	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	12/2/2003
Esfenvalerate	66230-04-4	109303	Group E--Evidence of Non-carcinogenicity for Humans	7/1/1996
Ethaboxam	162650-77-3	090205	Suggestive Evidence of Carcinogenic Potential	3/23/2006
Ethalfluralin	55283-68-6	113101	Group C--Possible Human Carcinogen	9/14/1994
Ethephon	16672-87-0	099801	Group D--Not Classifiable as to Human Carcinogenicity	8/15/1994

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Ethion	563-12-2	058401	Group E--Evidence of Non-carcinogenicity for humans	1/26/1994
Ethiprole	181587-01-9	005550	Suggestive Evidence Of Carcinogenic Potential	10/28/2010
Ethofumesate	26225-79-6	110601	Group D--Not Classifiable as to Human Carcinogenicity	2/24/1994
Ethoprop	13194-48-4	041101	Likely to be Carcinogenic to Humans	10/7/1998
Ethyl dipropylthiocarbamate (EPTC)	759-94-4	041401	Not Likely to Be Carcinogenic to Humans	8/31/1999
Ethylene thiourea (ETU)	96-45-7	600016	Group B--Probable Human Carcinogen	7/7/1999
Etofenprox	80844-07-1	128965	Not likely to be carcinogenic to humans at doses that do not alter rat thyroid hormone homeostasis.	2/8/2006
Etoxazole	153233-91-1	107091	Not Likely to Be Carcinogenic to Humans	8/7/2003
Famoxadone	131807-57-3	113202	Not Likely to Be Carcinogenic to Humans	4/16/2003
Fenamidone	161326-34-7	046679	Not Likely to Be Carcinogenic to Humans	7/12/2002
Fenamiphos	22224-92-6	100601	Group E--Evidence of Non-carcinogenicity for Humans	11/23/1993
Fenarimol	60168-88-9	206600	Not Likely to Be Carcinogenic to Humans	9/5/2001
Fenazaquin	120928-09-8	044501	Not Likely To Be Carcinogenic To Humans	5/15/2007
Fenbuconazole	114369-43-6	129011	Group C--Possible Human Carcinogen	4/15/1996
Fenbutatin-oxide	13356-08-6	104601	Group E--Evidence of Non-carcinogenicity for Humans	3/2/1993
Fenhexamide	126833-17-8	090209	Not Likely to Be Carcinogenic to Humans	3/4/1999

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Fenitrothion	122-14-5	105901	Group E--Evidence of Non-carcinogenicity for Humans	7/13/1993
Fenoxaprop-ethyl	9015-56-9	128701	Suggestive Evidence Of Carcinogenic Potential Suggestive Evidence Of Carcinogenic Potential	7/29/2013
Fenoxycarb	72490-01-8	125301	Likely to be Carcinogenic to Humans	12/22/97
Fenpropathrin	39515-41-8	127901	Not Likely to be Carcinogenic to Humans	12/22/2003
Fenpropidin	67306-00-7	012305	Suggestive Evidence Of Carcinogenic Potential	6/9/2009
Fenpropimorph	67564-91-4	121402	Not Likely To Be Carcinogenic To Humans	10/19/2005
Fenpyroximate	134098-61-6	129131	Not Likely to Be Carcinogenic to Humans	2/19/1997
Fenthion	55-38-9	053301	Group E--Evidence of Non-carcinogenicity for Humans	3/11/1996
Fenvalerate	51630-58-1	109301	Group E--Evidence of Non-carcinogenicity for Humans	2/10/2003
Ferbam	14484–64–1	034801	See Ziram	4/6/2000
Fipronil	120068-37-3	129121	Group C--Possible Human Carcinogen	7/18/1995
Flazasulfuron	104040-78-0	119011	Not Likely To Be Carcinogenic To Humans	11/16/2005
Flonicamid	158062-67-0	128016	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	2/24/2005
Florasulam	145701-23-1	129108	Not Likely To Be Carcinogenic To Humans	5/31/2007
Fluazifop-P-Butyl	79241-46-6	122809	Not Likely To Be Carcinogenic To Humans	9/19/2008

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Fluazinam	79622-59-6	129098	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	3/29/2001
Flubendiamide	272451-65-7	027602	Not Likely To Be Carcinogenic To Humans	4/3/2008
Flucarbazone-sodium	181274-17-9	114009	Not Likely to Be Carcinogenic to Humans	7/19/2000
Fludioxonil	131341-86-1	071503	Group D--Not Classifiable as to Human Carcinogenicity	9/19/1996
Fluensulfone	318290-98-1	050410	Suggestive Evidence Of Carcinogenic Potential	05/07/2014
Flufenacet (Thiaflumide)	142459-58-3	121903	Not Likely to Be Carcinogenic to Humans	7/16/1997
Flufenoxuron	101463-69-8	108203	Not Likely To Be Carcinogenic To Humans	8/15/2006
Flufenpyr-ethyl	188489-07-8	108853	Not Likely to Be Carcinogenic to Humans	6/8/2003
Flumethrin	69770-45-2	036007	Not Likely To Be Carcinogenic To Humans	03/06/12
Flumetralin	62924-70-3	123001	Not Likely To Be Carcinogenic To Humans	6/21/2007
Flumetsulam (XRD-498)	98967-40-9	129016	Group E--Evidence of Non-carcinogenicity for Humans	3/24/1993
Flumiclorac pentyl	87546-18-7	128724	Group E--Evidence of Non-carcinogenicity for Humans	9/7/1994
Flumioxazin	103361-09-7, 141490-50-8	129034	Not Likely to Be Carcinogenic to Humans	2/22/2001
Fluometuron	2164-17-2	035503	Group C--Possible Human Carcinogen	8/28/1996
Fluopicolide	239110-15-7	027412	Not Likely to Be Carcinogenic to Humans	12/12/2006
Fluopyram	658066-35-4	080302	Not Likely To Be Carcinogenic To Humans	05/08/2014

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Fluoxastrobin	361377-29-9	028869	Not Likely To Be Carcinogenic To Humans	1/24/2005
Flupyradifurone	951659-40-8	122304	Not likely to be Carcinogenic to Humans	8/5/2014
Fluridone	59756-60-4	112900	Group E--Evidence of Non-carcinogenicity for Humans	7/1/1985
Fluroxypyr	81406-37-3	128968	Not Likely To Be Carcinogenic To Humans	6/26/2003
Fluroxypyr acid (see also PC Code 128968)	69377-81-7	128959	Not Likely to Be Carcinogenic to Humans	6/26/2003
Flurprimidol	56425-91-3	125701	Not Likely To Be Carcinogenic To Humans	9/29/2005
Fluthiacet methyl	117337-19-6	108803	Likely to be Carcinogenic to Humans	11/20/1998
Flutolanil	66332-96-5	128975	Group E--Evidence of Non-carcinogenicity for Humans	6/9/1994
Flutriafol	76674-21-0	128940	Not Likely To Be Carcinogenic To Humans	6/1/2009
Fluxapyroxad	907204-31-3	138009	Not Likely To Be Carcinogenic To Humans: below a defined dose range	6/9/2011
Folpet	133-07-3	081601	Not likely to be carcinogenic to humans at doses that do not cause an irritation response in the mucosal epithelium	10/13/2010
Fomesafen	108731-70-0	123802	Not Likely to Be Carcinogenic to Humans	11/3/2005
Fonofos	944-22-9	041701	Group E--Evidence of Non-carcinogenicity for Humans	11/10/1993
Forchlorfenuron	68157-60-8	128819	Not Likely To Be Carcinogenic To Humans	3/11/2008
Formasulfuron	173159-57-4	122020	Not Likely to Be Carcinogenic to Humans	9/19/2001
Formetanate hydrochloride	23422-53-9	097301	Group E--Evidence of Non-carcinogenicity for Humans	5/20/1996

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Fosetyl-Al	39148-24-8	123301	Not Likely To Be Carcinogenic To Humans	4/22/1999
Fosthiazate	98886-44-3	129022	Not Likely to Be Carcinogenic to Humans	9/15/2003
Furfural	98-01-1	043301	Likely To Be Carcinogenic To Humans	02/06/2014
Furilazole (MON 13900)	121776-33-8	911596	Likely to be Carcinogenic to Humans	10/15/1999
Furmecyclox	60568-05-0	122601	Group B--Probable Human Carcinogen	7/3/1985
Gamma Cyhalothrin	76703-62-3	128807	Not Likely to Be Carcinogenic to Humans	3/1/2004
Gentamicin Sulfate	1405-41-0	006325	Not Likely To Be Carcinogenic To Humans	3/21/2007
Glufosinate-ammonium	77182-82-2	128850	Not Likely to Be Carcinogenic to Humans	5/17/1999
Glutaraldehyde	111-30-8	043901	Not Likely to Be Carcinogenic to Humans	5/18/2006
Glyphosate	1071-83-6	417300	Group E--Evidence of Non-carcinogenicity for Humans	10/30/1991
Halosulfuron methyl (MON 1200)	100784-20-1	128721	Not Likely to Be Carcinogenic to Humans	2/26/1998
Haloxyfop-methyl	690806-40-2	125201	Group B--Probable Human Carcinogen	9/18/1989
Hexaconazole	79983-71-4	128925	Group C--Possible Human Carcinogen	1/21/1999
Hexavalent Chromium (CrVI)	18540-29-9	021101; 068302	Likely to be Carcinogenic to Humans	07/01/09
Hexazinone	51235-04-2	107201	Group D--Not Classifiable as to Human Carcinogenicity	7/27/1994
Hexythiazox	78587-05-0	128849	Likely To Be Carcinogenic To Humans	9/2/09
HOE107892	135590-91-9	811800	Not Likely to Be Carcinogenic to Humans	11/24/1998

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Hydramethylnon	67485-29-4	118401	Group C--Possible Human Carcinogen	3/28/1991
Hydrogen cyanamide	420-04-2	014002	Group C--Possible Human Carcinogen	9/15/1993
Hydroprene	41096-46-2	486300	Group D--Not Classifiable as to Human Carcinogenicity	6/8/1995
Imazalil	35554-44-0	111901	Likely to be Carcinogenic to Humans	12/7/1999
Imazamethabenz	81405-85-8	128842	Group D--Not Classifiable as to Human Carcinogenicity	6/11/1987
Imazamox	114311-32-9	129171	Not Likely to Be Carcinogenic to Humans	2/27/1997
Imazapic	81334-60-3	129041	Group E--Evidence of Non-carcinogenicity for Humans	9/27/1995
Imazapyr	81334-34-1	128821	Group E--Evidence of Non-carcinogenicity for Humans	10/5/1995
Imazaquin Acid	81335-37-7	128848	Not Likely To Be Carcinogenic To Humans	10/31/2005
Imazethapyr	81335-77-5	128922	Not Likely to Be Carcinogenic to Humans	1/31/2002
Imazosulfuron	122548-33-8	118602	Not Likely To Be Carcinogenic To Humans	3/13/2009
Imidacloprid	105827-78-9	129099	Group E--Evidence of Non-carcinogenicity for Humans	11/10/1993
Indaziflam	950782-86-2	080818	Not Likely To Be Carcinogenic To Humans	4/22/2010
Indoxacarb	173584-44-6	067710	Not Likely to Be Carcinogenic to Humans	7/17/2000
Iodomethane	74-88-4	000011	Not Likely to be Carcinogenic to Humans at doses that do not alter rat thyroid hormone homeostasis	11/10/2005

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Iodosulfuran	144550-36-7	122021	Not Likely to Be Carcinogenic to Humans	1/5/2004
Ipoconazole	125225-28-7	125618	Not Likely To Be Carcinogenic To Humans	5/28/2008
Iprodione	36734-19-7	109801	Likely to be Carcinogenic to Humans	2/26/1998
Iprovalicarb	140923-17-7	098359	Likely to be Carcinogenic to Humans	4/11/2002
Isofenphos	25311-71-1	109401	Group E--Evidence of Non-carcinogenicity for Humans	1/13/1998
Isophorone	78-59-1	047401	Group C--Possible Human Carcinogen	9/2/1999
Isopyrazam	881685-58-1	129222	Likely To Be Carcinogenic To Humans	2/2/2011
Isoxaben	82558-50-7	125851	Suggestive Evidence of Carcinogenic Potential	10/7/2008
Isoxadifen-ethyl	163520-33-0	823000	Not Likely to Be Carcinogenic to Humans	1/29/2001
Isoxaflutole	141112-29-0	123000	Likely to be Carcinogenic to Humans	09/30/97
Kasugamycin	6980-18-3	230001	Not Likely To Be Carcinogenic To Humans	8/17/2005
Kathon 886	55965-84-9	107106	Group D--Not Classifiable as to Human Carcinogenicity	5/18/1995
KBR 3023	119515-38-7	070705	Not Likely to Be Carcinogenic to Humans	6/9/1999
Kresoxim-methyl	143390-89-0	129111	Likely to be Carcinogenic to Humans	8/19/1999
Lactofen	77501-63-4	128888	Likely to be Carcinogenic in Humans at High Doses. Not Likely to be Carcinogenic to Humans at Low Doses	10/17/2006
Lambda cyhalothrin	91465-08-6	128897	Group D--Not classifiable as to Human Carcinogenicity	9/12/2002

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Lindane	58-89-9	009001	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	11/29/2001
Linuron	330-55-2	035506	Group C--Possible Human Carcinogen	11/20/2001
Malathion	121-75-5	057701	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	4/28/2000
Maleic hydrazide	123-33-1	051501	Group E--Evidence of Non-carcinogenicity for Humans	11/10/1993
Mancozeb	8018-01-7	014504	Group B--Probable Human Carcinogen	7/7/1999
Mandipropamid	374726-62-2	036602	Not Likely To Be Carcinogenic To Humans	1/21/2009
Maneb	12427-38-2	014505	Group B--Probable Human Carcinogen	7/7/1999
MB46513 (photodegradate of Fipronil)	120067-83-6	600050	Not Likely to Be Carcinogenic to Humans	12/6/2000
MCPA + Salts	94-74-6	030501	Not Likely to Be Carcinogenic to Humans	10/29/2003
MCPB Acid	94-81-5	019201	Not Likely To Be Carcinogenic To Humans	10/1/2008
Mecoprop-P	16484-77-8	129046	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	3/13/2003
Mefenoxam	70630-17-0	113502	Not Likely to Be Carcinogenic to Humans	5/17/2000
Mefluidide	53780-34-0	114001	Not Likely To Be Carcinogenic To Humans	5/30/2007
Melamine	108-78-1	777201	Group D--Not Classifiable as to Human Carcinogenicity	7/21/1993

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Mepanipyrim	110235-47-7	288203	Likely to be Carcinogenic to Humans	4/20/2004
Mepiquat Chloride	24307-26-4	109101	Not Likely To Be Carcinogenic To Humans	2/19/2003
Meptyldinocap (DE-126/Dinocap II)	131-72-6	036000	Group E--Evidence Of Non-Carcinogenicity For Humans	3/17/2009
Mercaptobenzothiazole, 2-	149-30-4	051701	Group C--Possible Human Carcinogen	11/19/1992
Mesosulfuron methyl	208465-21-8	122009	Not Likely to Be Carcinogenic to Humans	3/4/2004
Mesotrione	104206-82-8	122990	Not Likely to Be Carcinogenic to Humans	4/12/2001
Metaflumizone	139968-49-3	281250	Not Likely To Be Carcinogenic To Humans	1/24/2006
Metalaxyl	57837-19-1	113501	Group E--Evidence of Non-carcinogenicity for Humans	4/20/1994
Metaldehyde	108-62-3	053001	Suggestive Evidence of Carcinogenic Potential	6/23/2005
Metam sodium	137-42-8	039003	Likely To Be Carcinogenic To Humans	5/14/2009
Metconazole	125116-23-6	125619	Not Likely to Be Carcinogenic to Humans	4/14/2006
Methamidophos	10265-92-6	101201	Not Likely to Be Carcinogenic to Humans	02/12/1998
Methidathion	950-37-8	100301	Group C--Possible Human Carcinogen	2/19/1988
Methiocarb	2032-65-7	100501	Group D--Not Classifiable as to Human Carcinogenicity	3/2/1993
Methomyl	16752-77-5	090301	Group E--Evidence of Non-carcinogenicity for Humans	10/25/1996
Methoxyfenozide	161050-58-4	121027	Not Likely to Be Carcinogenic to Humans	7/1/1999
Methyl bromide	74-83-9	053201	Not Likely To Be Carcinogenic To Humans	06/20/2001

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Methyl isothiocyanate	6317-18-6	068103	There are insufficient data to characterize the cancer risk of MITC.	4/30/2009
Methyl parathion	298-00-0	053501	Not Likely to Be Carcinogenic to Humans	12/1/1997
Metiram	9006-42-2	014601	Group B--Probable Human Carcinogen	7/7/1999
Metofluthrin	240494-70-6	109709	Not Likely to Be Carcinogenic to Humans at doses that do not result in a mitogenic response.	7/26/2007
Metolachlor	51218-45-2	108801	Group C--Possible Human Carcinogen	11/16/1994
Metrafenone	220899-03-6	000325	Suggestive Evidence of Carcinogenic Potential	7/6/2006
Metribuzin	21087-64-9	101101	Group D--Not Classifiable as to Human Carcinogenicity	5/16/1995
Metsulfuron methyl	74223-64-6	122010	Not Likely to Be Carcinogenic to Humans	3/14/2002
Mevinphos	7786-34-7	015801	Not Likely To Be Carcinogenic To Humans	5/17/2000
MGK 264	113-48-4	057001	Group C--Possible Human Carcinogen	6/7/1995
MGK Replellent 326	136-45-8	047201	Group B--Probable Human Carcinogen	11/12/2002
Molinate	2212-67-1	041402	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	12/14/2000

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MON 4660	71526-07-3	600046	Likely to be Carcinogenic to Humans	12/9/1999
Monosodium acid methanearsonate (MMA)	2163-80-6	013803	Not Likely to Be Carcinogenic to Humans	7/26/2000
MSMA-calcium salt	5902-95-4	013806	Not Likely to Be Carcinogenic to Humans	12/14/2000
Myclobutanil	88671-89-0	128857	Group E--Evidence of Non-carcinogenicity for Humans	6/16/1994
NAA potassium salt	15165-79-4	056003	Not Likely To Be Carcinogenic To Humans	3/14/2012
Naled	300-76-5	034401	Group E--Evidence of Non-carcinogenicity for Humans	8/31/1994
Napropamide	15299-99-7	103001	Not Likely To Be Carcinogenic To Humans	7/7/2005
Naptalam Sodium Salt	132-67-2	030703	Group D--Not Classifiable as to Human Carcinogenicity	9/7/1994
Napthalene Acetates	2122-70-5	056008	Not Likely To Be Carcinogenic To Humans	3/5/2009
Nicosulfuron	111991-09-4	129008	Group E--Evidence of Non-carcinogenicity for Humans	9/1/1998
Nitrapyrin	1929-82-4	069203	Suggestive Evidence Of Carcinogenic Potential	3/1/2012
Norflurazon	27314-13-2	105801	Group C--Possible Human Carcinogen	11/2/1990
Novaluron	116714-46-6	124002	Not Likely to Be Carcinogenic to Humans	2/4/2004

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CHEMICAL	CAS NO.*	PC CODE**	CANCER CLASSIFICATION***	REPORT DATE****
Orthophenylphenol (see also PC 064104)	90-43-7	064103	Not Likely to Be Carcinogenic to Humans (quantification of cancer risk is not required since the NOAEL selected for the chronic Reference Dose would address the concerns for the precursor events leading to development of bladder and liver tumors)	10/12/2005
Orthophenylphenol, Sodium salt (see also PC 064103)	132-27-4	064104	Not Likely to Be Carcinogenic to Humans (quantification of cancer risk is not required since the NOAEL selected for the chronic Reference Dose would address the concerns for the precursor events leading to development of bladder and liver tumors)	10/12/2005
Orthosulfamuron	213464-77-8	108209	Suggestive Evidence of Carcinogenic Potential	10/26/2006
Oryzalin	19044-88-3	104201	Likely to be Carcinogenic to Humans	6/25/2003
Oxadiazon	19666-30-9	109001	Likely To Be Carcinogenic To Humans	5/1/2001
Oxadixyl	77732-09-3	126701	Group C--Possible Human Carcinogen	1/4/1989
Oxamyl	23135-22-0	103801	Group E--Evidence of Non-carcinogenicity for Humans	11/5/1996
Oxydemeton-methyl	301-12-2	058702	Not Likely to Be Carcinogenic to Humans	7/24/1997
Oxyfluorfen	42874-03-3	111601	Likely To Be Carcinogenic To Humans	4/20/2010

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Oxytetracycline	2058-46-0	006308	Group D--Not Classifiable as to Human Carcinogenicity	12/18/1992
Oxythioquinox	2439-01-2	054101	Group B--Probable Human Carcinogen	2/15/1996
Paclobutrazol	76738-62-0	125601	Group D--Not Classifiable as to Human Carcinogenicity	6/23/1994
Paradichlorobenzene	106-46-7	061501	Not Likely To Be Carcinogenic To Humans	6/5/2007
Paranitrophenol	100-02-7	056301	Group D--Not Classifiable as to Human Carcinogenicity	5/14/1996
Paraquat dichloride	1910-42-5	061601	Group E--Evidence of Non-carcinogenicity for Humans	4/19/2000
Parathion, ethyl-	56-38-2	057501	Group C--Possible Human Carcinogen	9/11/1991
Pebulate	1114-71-2	041403	Not Likely to Be Carcinogenic to Humans	12/7/1998
Pendimethalin	40487-42-1	108501	Group C--Possible Human Carcinogen	7/24/1992
Penflufen	494793-67-8	100249	Suggestive Evidence Of Carcinogenic Potential	3/30/2011
Penoxulam	219714-96-2	119031	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	3/24/2004
Pentachloronitrobenzene (PCNB)	82-68-8	056502	Group C--Possible Human Carcinogen	12/18/1992
Pentachlorophenol	87-86-5	063001	Group B--Probable Human Carcinogen	1/3/1991
Penthiopyrad	183675-82-3	090112	Suggestive Evidence Of Carcinogenic Potential	10/18/2011
Permethrin	52645-53-1	109701	Likely to be Carcinogenic to Humans	10/23/2002

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Phenmedipham	13684-63-4	098701	Group D--Not Classifiable as to Human Carcinogenicity	4/28/1993
PHMB	32289-58-0	111801	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	07/16/2003
Phorate	298-02-2	057201	Group E--Evidence of Non-carcinogenicity for Humans	12/30/1993
Phosalone	2310-17-0	097701	Not Likely to Be Carcinogenic to Humans	8/12/1999
Phosmet	732-11-6	059201	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	10/27/1999
Phosphamidon	13171-21-6	018201	Group C--Possible Human Carcinogen	5/31/1989
Phostebupirim	96182-53-5	129086	Group E--Evidence of Non-carcinogenicity for Humans	4/27/1993
Picloram Acid	1918-02-1	005101	Group E--Evidence of Non-carcinogenicity for Humans	4/1/1994
Picloram Acid Ethylhexyl Ester	26952-20-5	005103	Group E--Evidence of Non-carcinogenicity for Humans	4/1/1994
Picloram Acid Potassium Salt	2545-60-0	005104	Group E--Evidence of Non-carcinogenicity for Humans	4/1/1994
Picloram Acid Triisopropanolamine Salt	6753-47-5	005102	Group E--Evidence of Non-carcinogenicity for Humans	4/1/1994
Picoxystrobin	117428-22-5	129200	Suggestive Evidence Of Carcinogenic Potential	11/15/11
Pinoxaden	243973-20-8	147500	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	5/18/2005
Piperonyl butoxide	51-03-6	067501	Group C--Possible Human Carcinogen	6/7/1995
Pirimicarb	23103-98-2	106101	Likely to be Carcinogenic to Humans	7/13/2005

For information about future review of these pesticides, see the Registration Review schedule/status at http://www2.epa.gov/pesticide-reevaluation

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Pirimiphos-methyl	29232-93-7	108102	Cannot Be Determined	1/29/1998
Polymeric Betaine	214710-34-6	103679	Inadequate Information to Assess Carcinogenic Potential	10/3/2006
Potassium dichromate	7778-50-9	068302	See Hexavalent Chromium (CrVI)	07/01/2009
Prallethrin	23031-36-9	128722	Not Likely to Be Carcinogenic to Humans	6/27/2003
Primisulfuron-methyl	86209-51-0	128973	Group D--Not Classifiable as to Human Carcinogenicity	5/3/1990
Prochloraz	67747-09-5	128851	Group C--Possible Human Carcinogen	7/1/1988
Procymidone	32809-16-8	129044	Group B--Probable Human Carcinogen	4/5/1991
Prodiamine	29091-21-2	110201	Group C--Possible Human Carcinogen	6/10/1991
Profenofos	41198-08-7	111401	Group E--Evidence of Non-carcinogenicity for Humans	2/6/1996
Prohexadione	127277-53-6	112600	Not Likely to Be Carcinogenic to Humans	4/14/2000
Prometon	1610-18-0	080804	Group D--Not Classifiable as to Human Carcinogenicity	11/25/1992
Prometryn	7287-19-6	080805	Group E--Evidence of Non-carcinogenicity for Humans	7/26/1994
Pronamide	23950-58-5	101701	Group B--Probable Human Carcinogen	12/10/2001
Propachlor	1918-16-7	019101	Likely to be Carcinogenic to Humans	10/16/1997
Propamocarb hydrochloride	25606-41-1	119302	Not Likely To Be Carcinogenic To Humans	5/31/2000
Propanil	709-98-8	028201	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	6/19/2001

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Propargite	2312-35-8	097601	Group B--Probable Human Carcinogen	7/23/1992
Propazine	139-40-2	080808	Not Likely to Be Carcinogenic to Humans	12/8/2005
Propetamphos	31218-83-4	113601	Not Likely to Be Carcinogenic to Humans	10/31/1998
Propiconazole	60207-90-1	122101	Group C--Possible Human Carcinogen	9/11/1992
Propineb	12071-83-9	522200	Likely To Be Carcinogenic To Humans	2/11/2013
Propoxur	114-26-1	047802	Group B--Probable Human Carcinogen	6/17/1996
Propoxycarbazone-Sodium	181274-15-7	122019	Not Likely to Be Carcinogenic to Humans	4/6/2004
Proquinazid	189278-12-4	044502	Suggestive Evidence Of Carcinogenic Potential	4/24/2013
Prosulfuron	94125-34-5	129031	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	1/24/2000
Prothioconazole	178928-70-6	113961	Not Likely To Be Carcinogenic To Humans	12/31/2007
Pymetrozine	123312-89-0	101103	Likely to be Carcinogenic to Humans	9/22/1999
Pyraclostrobin	175013-18-0	099100	Not Likely to Be Carcinogenic to Humans	2/15/2007
Pyraflufen ethyl	129630-19-9	030090	Likely to be Carcinogenic to Humans	10/8/2002
Pyrasulfotole	365400-11-9	000692	Suggestive Evidence Of Carcinogenic Potential	5/17/2007
Pyrazon	1698-60-8	069601	Not Likely To Be Carcinogenic To Humans	7/28/2005

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Pyrethrins	8003-34-7	069001	Not Likely To Be Carcinogenic To Humans at doses that do not cause mitogenic repsonse in the liver cell proliferation	2/14/2008
Pyridaben	96489-71-3	129105	Group E--Evidence of Non-carcinogenicity for Humans	5/11/1994
Pyridalyl	179101-81-6	295149	Not Likely To Be Carcinogenic To Humans	08/03/2004
Pyridate	55512-33-9	128834	Not Likely To Be Carcinogenic To Humans	1/24/2000
Pyrifluquinazon	337458-27-2	555555	Not Likely To Be Carcinogenic To Humans at levels that do not alter rodent hormone homeostasis	6/21/2012
Pyrimethanil	53112-28-0	288201	Group C--Possible Human Carcinogen	2/11/1997
Pyriofenone	688046-61-9	028828	Not Likely To Be Carcinogenic To Humans	12/14/2011
Pyriproxyfen	95737-68-1	129032	Group E--Evidence of Non-carcinogenicity for Humans	8/15/1995
Pyrithiobac-sodium	123343-16-8	078905	Group C--Possible Human Carcinogen	9/5/1995
Pyroxasulfone	447399-55-5	090099	Not Likely To Be Carcinogenic To Humans at doses below those that cause urinary bladder calculi formation resulting in cellular damage of the urinary tract	05/17/2011
Pyroxsulam	422556-08-9	108702	Not Likely To Be Carcinogenic To Humans	7/12/2007
Quinchlorac	84087-01-4	128974	Group D--Not Classifiable as to Human Carcinogenicity	8/26/1992

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Quinoxyfen	124495-18-7	055459	Not Likely to Be Carcinogenic to Humans	1/28/2003
Quizalofop ethyl	76578-14-8	128711	Group D--Not Classifiable as to Human Carcinogenicity	3/17/1988
Resmethrin	10453-86-8	097801	Likely to be Carcinogenic to Humans	5/25/2005
Rimsulfuron	122931-48-0	129009	Not Likely to Be Carcinogenic to Humans	2/19/1998
RoteNone	83-79-4	071003	Group E--Evidence of Non-carcinogenicity for Humans	10/5/1988
Saflufenacil (BAS 800 H)	372137-35-4	118203	Not Likely To Be Carcinogenic To Humans	7/22/2009
S-Bioallethrin	28434-00-6	004004	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	12/2/2003
Sedaxane	874967-67-6	129223	Likely To Be Carcinogenic To Humans	5/18/2011
Sethoxydim	74051-80-2	121001	Not Likely to Be Carcinogenic to Humans	3/19/2003
Simazine	122-34-9	080807	Not Likely to be Carcinogenic to Humans	4/14/2005
s-Metolachlor	87392-12-9	108800	Group C--Possible Human Carcinogen	9/28/2001
Sodium bentazon	50723-80-3	103901	Group E--Evidence Of Non-Carcinogenicity For Humans	1/14/1992
Sodium omadine	15922-78-8	088004	Group D--Not Classifiable as to Human Carcinogenicity	5/16/1995
Spinetoram	187166-40-1 + 187166-15-0	110008	Not Likely To Be Carcinogenic To Humans	9/20/2007
Spinosad	131929-60-7	110003	Not Likely to Be Carcinogenic to Humans	7/18/2002

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Spirodiclofen	148477-71-8	124871	Likely to be Carcinogenic to Humans	6/10/2004
Spiromesifen	283594-90-1	024875	Not Likely To Be Carcinogenic To Humans	5/21/2008
Spirotetramat	203313-25-1	392201	Not Likely To Be Carcinogenic To Humans	3/26/2009
Spiroxamine	118134-30-8	120759	Not Likely to Be Carcinogenic to Humans	11/14/2003
Sulfentrazone	122836-35-5	129081	Group E--Evidence of Non-carcinogenicity for Humans	5/7/1996
Sulfosate	81591-81-3	128501	Group E--Evidence of Non-carcinogenicity for Humans	7/26/1994
Sulfosulfuron	141776-32-1	085601	Not Likely to be Carcinogenic to Humans at doses that do not cause crystals with subsequent calculi formation resulting in cellular damage of the urinary tract.	12/16/2008
Sulfoxaflor	946578-00-3	005210	Suggestive Evidence Of Carcinogenic Potential	4/26/12
Sulfuryl fluoride	2699-79-8	078003	Not Likely to Be Carcinogenic to Humans	5/24/2001
Sulprofos	35400-43-2	111501	Group E--Evidence of Non-carcinogenicity for Humans	3/26/1996
Sumithrin	26002-80-2	069005	Not Likely to Be Carcinogenic to Humans	5/30/2006
Tau-fluvalinate	102851-06-9	109302	Not Likely To Be Carcinogenic To Humans	9/29/2005
TCMTB (Busan 72)	21564-17-0	035603	Group C--Possible Human Carcinogen	8/28/1996
Tebuconazole	107534-96-3	128997	Group C--Possible Human Carcinogen	9/15/1993

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Tebufenozide	112410-23-8	129026	Group E--Evidence of Non-carcinogenicity for Humans	8/29/1994
Tebufenpyrad	119168-77-3	090102	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	7/15/2002
Tebuthiuron	34014-18-1	105501	Group D--Not Classifiable as to Human Carcinogenicity	3/1/1993
Tefluthrin	79538-32-2	128912	Not Likely To Be Carcinogenic To Humans	5/30/2012
Telone	542-75-6	029001	Group B--Probable Human Carcinogen	3/19/2002
Tembotrione	335104-84-2	012801	Suggestive Evidence of Carcinogenic Potential	5/22/2007
Tepraloxydim	149979-41-9	121005	Data Are Inadequate for an Assessment of Human Carcinogenic Potential	2/27/2001
Terbacil	5902-51-2	012701	Group E--Evidence of Non-carcinogenicity for Humans	9/30/1994
Terbufos	13071-79-9	105001	Group E--Evidence of Non-carcinogenicity for Humans	3/9/1994
Terbuthylazine	5915-41-3	080814	Group D--Not Classifiable as to Human Carcinogenicity	8/24/1994
Terbutryn	886-50-0	080813	Group C--Possible Human Carcinogen	3/3/1988
Terrazole	2593-15-9	084701	Group B--Probable Human Carcinogen	6/29/1999
Tetrachlorvinphos	961-11-5	083701	Likely to be Carcinogenic to Humans	3/7/2002

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Tetraconazole	112281-77-3	120603	Not Likely To Be Carcinogenic To Humans at levels that do not cause increased cell proliferation in the liver	4/2/2013
Tetramethrin	7696-12-0	069003	Group C--Possible Human Carcinogen	12/11/1989
Thiabendazole	148-79-8	060101	Likely to be Carcinogenic to Humans at High Does; Not Likely to be Carcinogenic to Humans at Low Doses	3/8/2002
Thiacloprid	111988-49-9	014019	Likely to be Carcinogenic to Humans	10/31/2012
Thiamethoxam	153719-23-4	060109	Not Likely to Be Carcinogenic to Humans	6/13/2005
Thiazopyr (MON 13200)	117718-60-2	129100	Suggestive Evidence Of Carcinogenic Potential	12/6/2007
Thidiazuron	51707-55-2	120301	Not Likely To Be Carcinogenic To Humans	8/31/2005
Thiencarbazone-methyl	317815-83-1	015804	Not Likely To Be Carcinogenic To Humans at doses that do not cause urothelium cytotoxicity	2/29/2008
Thifensulfuron methyl	79277-27-3	128845	Not Likely To Be Carcinogenic To Humans	12/12/2006
Thiobencarb (Bolero)	28249-77-6	108401	Group D--Not Classifiable as to Human Carcinogenicity	6/10/1996
Thiocyclam hydrogen oxalate	31895-22-4	128868	Group D--Not Classifiable as to Human Carcinogenicity	9/15/1994
Thiodicarb	59669-26-0	114501	Group B--Probable Human Carcinogen	6/10/1996
Thiophanate-methyl	23564-05-8	102001	Likely to be Carcinogenic to Humans	8/24/1999

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Thiram	137-26-8	079801	Not Likely to Be Carcinogenic to Humans	4/14/2003
Tolclofos-methyl	57018-04-9	128905	Not Required (nonfood)	3/22/2012
Tolfenpyrad	129558-76-5	090111	Not Likely To Be Carcinogenic To Humans	06/03/2010
Tolyfluanid	731-27-1	309200	Likely to be Carcinogenic to Humans	6/18/2002
Topramezone	210631-68-8	123009	Not Likely to be Carcinogenic to Humans at Doses that Do Not Alter Rat Thyroid Hormone Homeostasis	5/19/2005
Tralkoxydim	87820-88-0	121000	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	6/30/2004
Triadimefon	43121-43-3	109901	Group C--Possible Human Carcinogen	12/4/1996
Triadimenol	55219-65-3	127201	Group C--Possible Human Carcinogen	1/29/1988
Triallate	2303-17-5	078802	Group C--Possible Human Carcinogen	1/12/1994
Triasulfuron	82097-50-5	128969	Group E--Evidence of Non-carcinogenicity for Humans	2/27/1991
Triazamate	112143-82-5	128100	Not Likely to Be Carcinogenic to Humans	12/1/1997
Tribenuron methyl	101200-48-0	128887	Group C--Possible Human Carcinogen	7/14/1989
Tribufos	78-48-8	074801	Likely to be Carcinogenic to Humans (High Doses); Not Likely to be Carcinogenic to Humans (Low Doses)	5/22/1997
Tributyltin maleate	14275-57-1	083118	Group D--Not Classifiable As To Human Carcinogenicity	3/31/2005

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Trichlorfon	52-68-6	057901	Likely to be Carcinogenic to Humans (High Doses), Not Likely to be Carcinogenic to Humans (Low Doses)	7/15/1999
Triclopyr	55335-06-3	116001	Group D--Not Classifiable as to Human Carcinogenicity	5/9/1996
Triclosan	3380-34-5	054901	Not Likely To Be Carcinogenic To Humans	1/4/2008
Tridiphane	58138-08-2	123901	Group C--Possible Human Carcinogen	4/22/1986
Trifloxystrobin	141517-21-7	129112	Not Likely to Be Carcinogenic to Humans	6/16/1999
Trifloxysulfuron	290332-10-4	119009	Not Likely to Be Carcinogenic to Humans	7/22/2003
Triflumizole	68694-11-1	128879	Group E--Evidence of Non-carcinogenicity for Humans	8/10/1993
Trifluralin	1582-09-8	036101	Group C--Possible Human Carcinogen	4/11/1986
Triflusulfuron-methyl	126535-15-7	129002	Group C--Possible Human Carcinogen	5/28/1996
Triforine	26644-46-2	107901	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	6/29/2004
Trinexapac-Ethyl	95266-40-3	112602	Not Likely To Be Carcinogenic To Humans	9/5/2008
Triphenyltin hydroxide (TPTH)	76-87-9	083601	Group B--Probable Human Carcinogen	5/24/1990
Triticonazole	131983-72-7	125620	Not Likely to be Carcinogenic to Humans	6/15/2006
Troysan polyphase (IPBC)	55406-53-6	107801	Not Likely to Be Carcinogenic to Humans	12/4/1996
UDMH	57-14-7	600018	Group B--Probable Human Carcinogen	7/26/1991
UMP-488 (PAL 6000)	111578-32-6	129025	Group E--Evidence of Non-carcinogenicity for Humans	5/6/1994

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Uniconazole	83657-22-1	128976	Group C--Possible Human Carcinogen	10/11/1990
Vinclozolin	50471-44-8	113201	Group C--Possible Human Carcinogen	6/20/2000
Zeta-Cypermethrin	52315-07-8	129064	Group C--Possible Human Carcinogen	9/27/1988
Ziram	137-30-4	034805	Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential	2/6/2003
Zoxamide	156052-68-5	101702	Not Likely to Be Carcinogenic to Humans	2/7/2001

*CAS No.: a chemical identifier designated by the Chemical Abstracts Service

**PC Code: a unique chemical identifier used by the Office of Pesticide Programs

***Cancer Classification: Simple descriptors used to express conclusions regarding the carcinogenic hazard potential of a chemical based on all relevant information, which is usually laboratory studies. These phases changed over time, as the Agency's guidance for carcinogenicity assessment was updated and revised.

****Report: Date of the Carcinogen Assessment Review Committee (CARC) report. The CARC report date does not necessarily reflect the date of the pesticide risk assessment. For example, all existing pesticide tolerances that were in place as of August 1996 were re-assessed for their health risks by August 2006 as required by the Food Quality Protection Act, and if there was no new information on carcinogenicity, the compound was not re-evaluated by the CARC.