

FUNGICIDES:

An Overview of Health Effects
Information Currently Available

Special Pesticide Review Division

Office of Pesticide Programs

September 16, 1980

INTRODUCTION

Fungicides are being more heavily affected by the RPAR process than any other major class of pesticides regulated under FIFRA.

Twelve major fungicides are or will be reviewed by OPP. Nine fungicides (six of which are EBDC's) are currently in the RPAR process and another three have been accepted for pre-RPAR review. In addition, another major fungicide has been referred for pre-RPAR based on oncogenicity data. There are still other pesticides not considered major fungicides but registered for fungicidal uses which are also in the various stages of the RPAR process. Cadium, sodium pentachlorophenol, and thiophanate are some examples.

Even for the remaining fungicides identified in this paper, there is reasonable probability that as data gaps are filled, information will indicate some or most of them present adverse affects to man or the environment.

Attachment I lists the major fungicides addressed in this report and summarizes the current toxicity information and regulatory status.

Attachment II summarizes this information and presents it in tabular form to correspond to the eighteen (18) use-site categories presented in the BFSD portion of this report. This chart can be used to assess the health problems identified with the alternatives available for each use.

ATTACHMENT 1

MAJOR FUNGICIDES USED IN AGRICULTURE

<u>Fungicide</u>	<u>Toxicity and Regulatory Status Information</u>
1. Benomyl*	1. PD-2/3 issued on 8/22/79; mutagenicity, teratogenicity, and reduction in spermatogenic activity, chronic risk criteria were exceeded; point mutagen risk was rebutted on insufficient evidence; <u>New</u> study indicates chemical is an oncogen.
2. Cadmium	2. RPAR issued 10/26/77 based on oncogenicity; mutagenicity, teratogenicity and fetotoxicity.
3. Captafol (Difolaton)*	3. Accepted for pre-RPAR review on 7/14/78; data suggest chemical meets risk criteria for mutagenicity and teratogenicity; indicated data gaps- <u>oncogenicity</u> , mutagenicity, neurotoxicity; many existing studies in data base done by IBT.
4. Captan*	4. PD 1 issued 8/16/80; triggers are oncogenicity and mutagenicity; may have other chronic effects; insufficient data to draw teratogenicity conclusion; indicated data gaps - subacute and chronic toxicity.
5. Chlorothalonil*	5. Rejected for pre-RPAR review on 9/13/77; rereferred because of recent (1978) NCI study positive for <u>oncogenicity</u> ; appears to be neurotoxicity data gap; contaminant residue (HCB) on food is a presumed carcinogen.

6. Coppers*
 - a. Copper naphenates
 - b. Copper Sulfate and other inorganic copper salts
 7. 1,3 Dicloropropene
 8. Dinocap (Karathane)*
 9. Dodine* -
 10. EBDC's
 - a. Amobam*
 - b. Mancozeb*
6.
 - a. No adverse toxicity data available indicative of possible trigger for RPAR criteria; appears to be a number of gaps in chronic data base.
 - b. No adverse toxicity data available indicative of possible trigger for RPAR criteria; appears to be a number of gaps in the chronic data base.
 7. Accepted for pre-RPAR review 11/7/77 based on mutagenicity; potential carcinogen.
 8. Has a very close structural similarity to Dinitrophenol (DNP), a well-known cataractogenic agent and uncoupling agent of the oxidative phosphorylation of ADP to ATP in cellular metabolism; data gaps include the following studies - oncogenic, mutagenic, teratogenic, neurotoxicity and reproductivity; questions on cataract formation and margin of safety need to be addressed.
 9. Much available data is old; data gaps - teratology, possible second oncogenic study.
 10.
 - a. RPAR issued on 8/10/77; an oncogen and teratogen, probably on the basis of ETU, the degradation product common to all EBDC's.
 - b. RPAR issued on 8/10/77; an oncogen and teratogen, probably on the basis of ETU, the degradation product common to all EBDC's.

- c. Metiram*
 - c. RPAR issued on 8/10/77; an oncogen and teratogen, probably on the basis of ETU, the degradation product common to all EBDC's.
 - d. Nabam*
 - d. RPAR issued on 8/10/77; an oncogen and teratogen, probably on the basis of ETU, the degradation product common to all EBDC's.
 - e. Maneb*
 - e. RPAR issued 8/10/77; an oncogen and teratogen, probably on basis of ETU, the degradation product common to all EBDC's; acutely toxic to wildlife and aquatic species when used on cranberries.
 - f. Zaneb*
 - f. RPAR issued 8/10/77; an oncogen and teratogen, probably on basis of ETU, the degradation product common to all EBDC's acutely toxic to wildlife and aquatic species when used on cranberries.
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- 11. Fenamiosulf
 - 11. Currently non-RPAR, referred to SPRD; potential mutagen.
 - 12. Ferbam*
 - 12. Existing tox data is old, incomplete and generally of little or no value; potential neurotoxicity problem; certain literature "indefinite" with respect to carcinogenic potential; data daps - acute dermal and inhalation toxicity, mutagenicity, and dermal and eye irritation and oncogenicity.
 - 13. Folpet (Phaltan)*
 - 13. Accepted for pre-RPAR on 10/31/77 on basis of teratogenicity; other tests indicate possible oncogen and mutagen under some conditions; chemical structure very much like that of captan.
 - 14. Hexachlorobenzene (HCB)
 - 14. Accepted for pre-RPAR based on mutagenicity, oncogenicity and teratogenicity.

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| 15. Methyl Bromide | 15. Referred to SPRD based on mutagenicity data. Review of data by HED indicates RPAR trigger is hit. |
| 16. PCNB* | 16. RPAR issued on 10/20/77 on basis of meeting the oncogenicity risk criteria; test indicate that HCB, a contaminant of PCNB, may induce oncogenic and reproductive effects. |
| 17. Sodium Phetachlorophenol | 17. RPAR issued on 10/17/77; on basis of teratogenicity and fetotoxicity. New study indicates chemical is an oncogen. |
| 18. Thiophanate-Methyl | 18. RPAR issued on 12/7/77 based on mutagenic trigger; significant local reduction in earthworm populations; both triggers rebutted; new oncogenic information received on metabolite, MBC, which is also present in benomyl; additional mutagenic testing required. |
| 19. Thiram* | 19. Accepted for pre-RPAR on 11/8/77 on basis of teratogenicity; possible neurotoxicity data gap. |

* The asterisked fungicides comprise considerably more than 90% of the total annual percentage of fungicides used in the production of food and fiber.

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON POME FRUITS (APPLES, PEARS)

A. Use: Foliar

B. Major Diseases: Scab, powdery mildew, rusts, fire blight, summer diseases, leaf spots.

C. Major Recommended Fungicides:

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<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC	1-1-1	RPAR issued; PD 2/3 in final draft	Oncogen, teratogen toxic to wildlife
Benomyl	2-1-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen reproductive effects, other chronic effects
Captan	2-2-1	PD 1 issued on 8/16/80	Oncogen, mutagen
<u>PRE-RPAR</u>			
Captafol	1-2-2	Pre-RPAR	Accepted as potential mutagen and teratogen
Folpet	1-2-2	Pre-RPAR	Accepted as potential teratogen; possible oncogen and mutagen
<u>NON-RPAR</u>			
Sulfur	2-3-3	Non-RPAR	Toxicity data available
Dodine	2-2-1	Non-RPAR	No adverse toxicity data available

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<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
Dinocap	1-3-1	Non-RPAR	Potential cataractogenic;
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available
Streptomycin	1-3-1	Non-RPAR	Toxicity data available
Oxyteracycline	1-3-1	Non-RPAR	Toxicity data available
Terramycin	1-3-1	Non-RPAR	Toxicity data available
Dithiocarbamates	2-1-2	Non-RPAR	Potential neurotoxicity problem

1/ All suitability assignments are taken from BFSD Document presented in Appendix 1.

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON STONE FRUITS (PEACHES, NECTARINES,
APRICOTS, PLUMS, PRUNES, CHERRIES)

A. Use: Foliar

B. Major Diseases: Brown rot, leaf curl, shot hole, green fruit rot, russet scab, rust, powdery mildew

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
Captan	1-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
Na PCP	3-3-3	RPAR issued 10/17/77	Oncogen, teratogen, fetotoxic
<u>PRE-RPAR</u>			
Captafol	1-2-1	Pre-RPAR	Potential mutagen, teratogen
<u>NON-RPAR</u>			
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available
Dichlone	2-2-2	Non-RPAR	Toxicity data available
Sulfur	2-2-3	Non-RPAR	Toxicity data available

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
Dinocap	1-3-1	Non-RPAR	Potential cataractogenic
Dithiocarbamates	1-2-1	Non-RPAR	Potential neurotoxicity problem

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON CITRUS (ORANGES, LEMONS, GRAPEFRUIT)

- A. Use: Foliar
- B. Major Diseases: Brown rot gummosis, greasy spot, melanose, scab
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, Mutagen, Teratogen, Reproductive Effects
<u>PRE-RPAR</u>			
Captafol	1-1-1	Pre-RPAR	Accepted as potential mutagen and teratogen
<u>NON-RPAR</u>			
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available
Oil Sprays	2-3-3	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON TROPICAL FRUITS (BANANAS,
MANGO, PINEAPPLES, PAPAYA)

A. Use: Foliar

B. Major Diseases: Sigatoka disease of bananas, stem-end rots, Phytophthora blight and anthracnose of papaya, root and heart rots.

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC's	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Benomyl	2-1-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
Captan	1-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
Thiophanate Methyl	2-1-1	Notice of Determination issued, continued registration allowed.	Potential mutagen and oncogen
<u>PRE-RPAR</u>			
Captafol	1-2-1	Pre-RPAR	Potential mutagen, teratogen
Chlorothalonil	1-2-1	Referred for Pre-RPAR	Potential oncogen

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>NON-RPAR</u>			
Oil Sprays	2-2-2	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON SMALL FRUITS (GRAPES, STRAWBERRIES,
BLUEBERRIES, CRANBERRIES, BRAMBLES)

A. Use: Foliar and Soil Treatments

B. Major Diseases: Foliar/blueberries - bacterial canker and mummyberry; cranberries - Guignardia blight and Lophodermium twig blight; grapes - powdery mildew; strawberries - powdery mildew, leaf spot, and anthracnose; all small fruits - botrytis fruit rots and blights. Soil/strawberries - red stele, root rots, Verticillium wilts.

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>FOLIAR</u>			
<u>RPAR's</u>			
Benomyl	2-1-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
Captan	2-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
EBDC's	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
<u>PRE-RPAR</u>			
Captafol	1-2-1	Pre-RPAR	Potential mutagen, teratogen
<u>NON-RPAR</u>			
Dichloran	1-3-2	Non-RPAR	Toxicity data available

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
Sulfur	2-3-3	Non-RPAR	Toxicity data available
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available
Biphenyl	1-3-3	Non-RPAR	Toxicity data available
Dodine	1-3-2	Non-RPAR	Toxicity data available
Ca Cyanide	1-3-3	Non-RPAR	Toxicity data available
Dithiocarbamates	1-2-1	Non-RPAR	Potential neurotoxicity problem

SOIL

PRE-RPAR

Methyl Bromide	1-1-3	Pre-RPAR	Potential mutagen
1,3-D, chloropropene	1-3-3	Pre-RPAR	Potential mutagen and oncogen

NON-RPAR

Chloropicrin	1-1-3	Non-RPAR	Toxicity data available
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SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON NUTS (WALNUTS, ALMONDS, PECANS,
FILBERTS)

A. Use: Foliar

B. Major Diseases: Brown rot, walnut blight, shot hole, bacterial canker, scab, downy shot, zonate leaf spot, powdery mildew

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
Captan	1-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
EBDC's	1-2-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Na PCP	3-3-3	RPAR issued 10/17/77	Oncogen, teratogen, fetotoxic
<u>NON-RPAR</u>			
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available
Dichlone	2-2-2	Non-RPAR	Toxicity data available
Triphenyltin Hydroxide	1-1-2	Non-RPAR	Toxicity data available

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
Dodine	2-2-1	Non-RPAR	No adverse toxicity data available
Sulfur	2-1-3	Non-RPAR	Toxicity data available
Ziram	2-2-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON SOLANACEOUS (TOMATO, POTATO,
PEPPER, EGGPLANT)

- A. Use: Foliar and Fruit
- B. Major Diseases: Late blight, Early blight, Anthracnose, Leaf spots, Wilts, Bacterial spot, Fruit rots
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC's	1-1-1	PD 2/3 in Final Draft	Oncogen, teratogen, toxic to wildlife
Captan	3-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
<u>PRE-RPAR</u>			
Captafol	2-2-1	Pre-RPAR	Potential mutagen, teratogen
Chlorothalonil	1-1-1	Referred for Pre-RPAR	Potential oncogen
Thiram	2-1-1	Pre-RPAR	Teratogen
<u>NON-RPAR/SUITABILITY</u>			
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available
Dithiocarbamates	2-1-1	Non-RPAR	Potential neurotoxicity problem
Dichloran	1-3-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
 USED ON LEAFY VEGETABLES (LETTUCE, SPINACH,
 COLLARDS, CABBAGE, BROCCOLI, CAULIFLOWER,
 CELERY, BRUSSEL SPROUTS)

- A. Use: Foliar
- B. Major Diseases: Leaf spots, Early blight, Late blight, Bottom rot, Downey mildew, Blackleg
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
EBDC's	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Captan	2-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
Benomyl	2-2-1	PD 2/3 issued	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
<u>PRE-RPAR</u>			
Chlorothalonil	1-2-1	Referred for Pre-RPAR	Potential oncogen
<u>NON-RPAR</u>			
Coppers	2-1-3	Non-RPAR	No adverse toxicity data available

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
Dithiocarbamates	2-1-1	Non-RPAR	Potential neurotoxicity problem
Dichloran	1-3-1	Non-RPAR	Toxicity data available
Analazine	2-3-2	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON SOYBEANS

- A. Use: Foliar
- B. Major Diseases: Pod and stem rots
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
<u>NON-RPAR</u>			
Thiabendazole	2-2-1	Non-RPAR	Toxicity data available
Copper	3-1-2	Non-RPAR	No adverse toxicity data available
Sulfur	3-1-2	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON PEANUTS

A. Use: Foliar

B. Major Diseases: Leaf spots, rust, web blotch

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
EBDC's	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Benomyl	2-2-1	PD 2/3 issued	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
<u>PRE-RPAR's</u>			
Chlorothalonil	1-1-1	Referred for Pre-RPAR	Potential oncogen
Captafol	1-1-1	Pre-RPAR	Potential mutagen, teratogen
<u>NON-RPAR's</u>			
Coppers	2-1-2	Non-RPAR	No adverse toxicity data available
Sulfur	3-2-2	Non-RPAR	Toxicity data available
Triphenyltin Hydroxide	1-1-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON TOBACCO

- A. Use: Foliar
- B. Major Diseases: Blue mold
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
<u>EBDC</u>	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
<u>NON-RPAR</u>			
Ridomil	1-1-1	Non-RPAR	Toxicity data available
Dithiocarbamates	2-1-1	Non-RPAR	Potential neurotoxicity problem

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON CEREAL CROPS (WHEAT, BARLEY, OATS,
RYE)

A. Use: Foliar

B. Major Diseases: Rust

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
EBDC	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
<u>NON-RPAR</u>			
Coppers	3-2-2	Non-RPAR	No adverse toxicity data available
Sulfur	3-2-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON ORNAMENTALS (CUT FLOWERS, POTTED
PLANTS, BEDDING PLANTS, TREES)

- A. Use: Foliage and soil treatments and plant dips
- B. Major Diseases: Rust, wilts, blights, powdery mildew, root,
stem and corm rots
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
EBDC's	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Captan	2-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
PCNB	1-3-1	RPAR issued 10/20/77	Oncogen, potential reproductive effects
<u>PRE-RPAR's</u>			
Chlorothalonil	1-1-1	Referred for Pre-RPAR	Potential oncogen
Fenamiosulf	1-2-1	Referred for Pre-RPAR	Potential mutagen
<u>NON-RPAR</u>			
Coppers	3-1-3	Non-RPAR	No adverse toxicity data available

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>NON-RPAR</u>			
Streptomycin	1-3-1	Non-RPAR	Toxicity data available
Oxycarboxin	1-3-1	Non-RPAR	Toxicity data available
Dinocap	1-3-1	Non-RPAR	Potential cataractogenic
Sulfur	2-1-3	Non-RPAR	Toxicity data available
Dichloran	2-2-1	Non-RPAR	Toxicity data available
Terrazole	1-3-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON TURFGRASS

A. Use: Foliar

B. Major Diseases: Dollar spot, brown patch, Helminthosporium diseases, snow molds, pythium blight, rusts

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
EBDC's	1-2-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
Cadiums	2-3-1	PD 1 issued 10/26/77	Oncogen, mutagen, teratogen, fetotoxic
PCNB	2-2-2	RPAR issued 10/20/77	Oncogen, potential reproductive effects
Thiophanate Methyl	2-2-1	Notice of Determination issued; continued registration allowed	Potential mutagen and oncogen
<u>PRE-RPAR</u>			
Chlorothalonil	1-1-1	Referred for Pre-RPAR	Potential oncogen
<u>NON-RPAR</u>			
Anilazine	2-1-1	Non-RPAR	Toxicity data available

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
Terrazole	2-3-1	Non-RPAR	Toxicity data available
Chloroneb	1-3-1	Non-RPAR	Toxicity data available
Improdione	1-3-1	Non-RPAR	Toxicity data available
Thiophanate-ethyl	2-2-1	Non-RPAR	Toxicity data available
Cycloheximide	1-2-2	Non-RPAR	Toxicity data available
Mercuries	1-3-2	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON FRUIT CROPS FOR POST HARVEST DISEASES

- A. Use: Post harvest treatment
- B. Major Diseases: Post harvest fruits rots
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
Benomyl	2-1-1	PD 2/3 issued	Oncogen, mutagen teratogen, reproductive effects, other chronic effects
Captan	2-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
<u>NON-RPAR/SUITABILITY</u>			
Thiabendazole	2-1-1	Non-RPAR	Toxicity data available
Biphenyl	2-1-1	Non-RPAR	Toxicity data available
Na OPP	2-2-1	Non-RPAR	Toxicity data available
2-Aminobutane	2-1-1	Non-RPAR	Toxicity data available
Dichloran	1-3-1	Non-RPAR	Toxicity data available
Chlorine	2-1-1	Non-RPAR	Toxicity data available
Sulfur Dioxide	1-3-2	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON VEGETABLES

- A. Use: Seed and seed piece treatment
- B. Major Diseases: Pre and post-harvest damping off, seed piece rots
- C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
Captan	1-1-1	PD 1 issued 8/16/80	Oncogen, mutagen
EBDC's	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
<u>PRE-RPAR</u>			
Thiram	2-1-1	Pre-RPAR	Teratogen
<u>NON-RPAR</u>			
Thiobendazole	2-2-1	Non-RPAR	Toxicity data available
Streptomycin	2-3-2	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
 USE ON FIELD CROPS (PEANUTS, COTTON, RICE
 CORN, SOYBEANS, SUGAR BEETS) AND CEREAL CROPS

A. Use: Seed treatment

B. Major Diseases: Field crops - pre and post emergence damping off; Cereal crops - smuts, seedling diseases

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
PCNB	1-3-1	RPAR issued 10/20/77	Oncogen, potential reproductive effects
Captan	2-3-1	PD 1 issued 8/16/80	Oncogen, mutagen
EBDC's	2-2-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
<u>PRE-RPAR</u>			
Thiram	2-2-1	Pre-RPAR	Teratogen
Hexachlorobenzene	1-3-1	Pre-RPAR	Oncogen
<u>NON-RPAR</u>			
Terrazole	2-3-1	Non-RPAR	Toxicity data available
Carboxin	2-3-1	Non-RPAR	Toxicity data available
Dichloran	2-3-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON VEGETABLES AND PEANUTS (TOMATO,
PEPPER, EGGPLANT, CRUCIFERS, BEANS)

- A. Use: Soil Treatment
- B. Major Diseases: Southern blight, stem canker, black scurf, wire stem (vegetables), southern blight (peanuts)
- C. Major Recommended Fungicides and Suitability:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR's</u>			
PCNB	1-2-1	RPAR issued 10/20/77	Oncogen, potential reproductive effects
EDBC's	3-1-1	PD 2/3 in Final draft	Oncogen, teratogen, toxic to wildlife
<u>NON-RPAR's</u>			
Carboxin	2-2-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON ROOT CROPS (ONION, CARROTS, BEETS,
TURNIPS)

A. Use: Foliar

B. Major Diseases: Leaf spots, Downey mildew, Neckrot, Blast

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Captan	2-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
<u>PRE-RPAR</u>			
Chlorothalonil	1-1-1	Referred for Pre-RPAR	Potential oncogen
<u>NON-RPAR</u>			
Amilazine	2-2-1	Non-RPAR	Toxicity data available
Coppers	2-1-3	Non-RPAR	No adverse toxicity data available
Dithiocarbamates	2-1-1	Non-RPAR	Potential neurotoxicity problem

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON CUCURBITS

A. Use: Foliar

B. Major Diseases: Downy mildew, Leaf Anthracnose, Gummy stem blight,
Powder mildew

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC	1-1-1	PD 2/3 in final draft	Oncogen, teratogen
Benomyl	2-2-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects
<u>PRE-RPAR</u>			
Chlorothalonil	1-1-1	Referenced for Pre-RPAR	Potential oncogen
<u>NON-RPAR</u>			
Dinocap	1-3-2	Non-RPAR	Potential cataractogen
Analazine	1-3-2	Non-RPAR	Toxicity data available
Dichloran	1-3-1	Non-RPAR	Toxicity data available

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED SWEET CORN

A. Use: Foliar

B. Major Diseases: Helminthosporium leaf blights, Stalk and ear rots

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC	1-1-1	PD 2/3 in final draft	Oncogen, teratogen, toxic to wildlife
Captan	2-2-1	PD 1 issued 8/16/80	Oncogen, mutagen
<u>PRE-RPAR</u>			
Chlorothalonil	1-2-1	Referred for Pre-RPAR	Potential oncogen

SUMMARY OF HEALTH EFFECTS DATA FOR FUNGICIDES
USED ON BEANS AND PEAS

A. Use: Foliar

B. Major Diseases: Bacterial blights, Rust, Powdery mildew, Leaf spots, Downey mildew, Storage

C. Major Recommended Fungicides:

<u>Fungicide</u>	<u>Suitability</u>	<u>Regulatory Status</u>	<u>Current Toxicity Information</u>
<u>RPAR</u>			
EBDC's	1-2-1	PD 2/3 in final draft	Oncogen, teratogen
Benomyl	2-3-1	PD 2/3 issued on 8/22/79	Oncogen, mutagen, teratogen, reproductive effects, other chronic effects
Captan	2-3-1	PD 1 issued 8/16/80	Oncogen, mutagen
<u>PRE-RPAR</u>			
Chlorothanil	2-2-1	Referred for Pre-RPAR Review	Potential oncogen
<u>NON-RPAR</u>			
Coppers	2-1-3	Non-RPAR	No adverse toxicity data available
Sulfur	3-2-3	Non-RPAR	Toxicity data available
Dithiocarbamates	1-2-1	Non-RPAR	Potential neurotoxicity problem