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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

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003523

OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Worker Re-entry Labeling for Nematicide Use of:  
Carbofuran Tox. No. 160A  
Fenamiphos Tox. No. 453A  
Oxamyl Tox. No. 561A  
Methomyl Tox. No. 549C

TO: Henry Jacoby, PM #21  
Registration Division (TS-767)

THRU: Dave Ritter, Acting Section Head  
Review Section #1  
Toxicology Branch/HED (TS-769) *12/15/83*

FROM: Raymond Landolt  
Review Section #1  
Toxicology Branch/HED (TS-769) *12-15-83*

Action Requested:

The State of California (Letter from Keith T. Macdy, 10/18/83) has recommended the following workers re-entry labeling for these four nematicides based on the dermal-dose-response data and accident reports submitted.

"Workers shall not enter a treated field with dry soil within 48 hours after completion of an application unless impervious boots are worn, and if any hand contact with soil is likely, they shall be protected with impervious gloves. Also, if a treated field is muddy, for a seven-day period following completion of an application, impervious boots shall be worn when entering such treated fields and impervious gloves shall be used if necessary to prevent hand contact with the soil.

When this product is being applied through a drip irrigation system, at the entry point to the field, or if there are no obvious entry points, at every 600 feet there shall be signs posted that are readable at 25 feet that state (in English and Spanish): "DANGER!"

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Pesticides are being applied in the water through the drip irrigation system. Do not drink water or walk on or handle wet soil." Instead of posting fields, the operator of the property may have a sufficient number of persons present during the entire application period to keep all persons not involved in the application from entering the application site."

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Recommendation:

The above recommended labeling is too wordy and should be reduced to a few statements such as "Danger: Pesticides being applied through irrigation system. Do not drink water. Avoid contact with wet soil". After a review of the accident reports it is apparent that in each incident the worker was warned either verbally or by signs posted, or by both, prior to the ingestion incident, of the presence of pesticides in the irrigation system. This observation leads one to question the value of such labeling. Additional measures need to be considered to ensure worker safety.

Toxicity Data Review

Dermal Absorption - Rat  
California Dept. of Food and Agriculture  
Knaak, J.B. et al., 1983 Acc. No. 251602

A. Procedure

One ml of the test material in acetone was applied in 0.5 ml increments (and allowed to dry) to a 25 cm clipped area of the back of male albino rats weighing 220 to 240 grams. Fenamiphos was applied to three rats per dosage level of 100, 100 and 400 ug/cm<sup>2</sup>. Fenamiphos sulfoxide was applied at 25(3), 50(3), 100(6), 200(6), 400(6), 800(3) ug cm<sup>2</sup> (number of animals treated in parentheses). Fenamiphos sulfone was applied at 200(6), 400(9), 800(6), 1600(3) ug/cm<sup>2</sup> (number of animals treated in parenthesis). Twenty five control animal were used. After 72 hours the animals were sacrificed and blood analyzed colorimetrically for cholinesterase activity. Parathion and paraoxon, with reference to the literature for exposure data, were used as reference standards to determine the safe levels.

B. Results

1. Red cell cholinesterase inhibition (50%) after 72 hours exposure to 25 cm<sup>2</sup> of treated skin.
  - a. Fenamiphos ED<sub>50</sub> 208 ug/cm<sup>2</sup>
  - b. Fenamiphos sulfoxide ED<sub>50</sub> 262 ug/cm<sup>2</sup>
  - c. Fenamiphos sulfone ED<sub>50</sub> 750 ug/cm<sup>2</sup>

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2. Safe level on foliage in  $\text{ug/cm}^2$  of total body surface exposed.
  - a. Reference standards of safe levels were reported to be  $0.09 \text{ ug/cm}^2$  for parathion and  $0.02 \text{ ug/cm}^2$  for paraoxon with a level of  $0.06 \text{ ug/cm}^2$  for the combined residues of parathion and paraoxon.
  - b. Safe level of fenamiphos and fenamiphos sulfoxide relative to parathion and paraoxon is  $1.0 \text{ ug/cm}^2$ .
  - c. Conclusion
    1. Classification of Data - Minimum
    2. Safe level for the combined residues of fenamiphos and fenamiphos sulfoxide that is not likely to inhibit cholinesterase in field workers is  $1.5 \text{ ug/cm}^2$  of skin area.
    3. Dislodgeable foliar residue data was not available.

Dermal Absorption - Rat  
California Dept. of Food and Agriculture  
Knack, J.B. et al., 1983. Acc. No. 251602

A. Procedure

One ml of oxamyl in acetone was applied in 0.5 ml increments (and allowed to dry) to  $31 \text{ cm}^2$  clipped area of the back of four male albino rats per dosage level of 0, 500, 1000, 2000, 4000  $\text{ug/cm}^2$ . The rats weighed between 300 and 350 grams. After 24 hour exposure the animals were sacrificed and blood analyzed colorimetrically for cholinesterase activity.

B. Results

1. Cholinesterase inhibition after 24 hr. exposure to  $31 \text{ cm}^2$  of treated skin.
  - a. A dose of  $500 \text{ ug/cm}^2$  resulted in a 49% plasma and 53% RBC inhibition.
  - b. Larger doses did not result in a dose response inhibition of cholinesterase activity. The three larger doses resulted in a 32 to 57% plasma and 39 to 66% RBC inhibition of cholinesterase.

- c. The water solubility and polarity of oxamyl may account for its rate limiting absorption.
2. A safe level on foliage that is not likely to inhibit cholinesterase is estimated to be 1.5 ug/cm<sup>2</sup> of skin area.

### C. Conclusion

1. Classification of Data - Minimum
2. A safe level for foliar residues of oxamyl that are not likely to inhibit cholinesterase in field workers is 1.5 ug/cm<sup>2</sup> of skin area.
3. Dislodgeable foliar residue data was not available.

Dermal Absorption - Rat  
California Dept. of Food and Agriculture  
Knaak, J.B. et al., 1983 Acc. No. 251602

### A. Procedure

One ml of methomyl in acetone was applied in 0.5 ml increments (and allowed to dry) to a 31 cm<sup>2</sup> clipped area of the back of six male albino rats per dosage level of 0, 500, 1000 and 2000 ug/cm<sup>2</sup>. The rats weighted between 300 to 350 grams. After a 24 hr. exposure the animals were sacrificed and blood analyzed colorimetrically for cholinesterase activity. Parathion and phosalone, with reference to the literature, were used as reference standards to determine the safe level. A 31 cm<sup>2</sup> of treated area represents 7% of body surface.

### B. Results

1. Cholinesterase inhibition (50%) after 24 hr. exposure to 31 cm<sup>2</sup> of treated skin.
  - a. Methomyl ED<sub>50</sub> 594 ug/cm<sup>2</sup> for RBC inhibition.  
ED<sub>50</sub> 4085 ug/cm<sup>2</sup> for plasma inhibition.
2. Safe level on foliage in ug/cm<sup>2</sup> of total body surface exposed.
  - a. Reference standards safe levels were reported to be 0.09 ug/cm<sup>2</sup> for parathion and 7.0 ug/cm<sup>2</sup> for phosalone.
  - b. Safe level of methomyl on foliage that is not likely to inhibit cholinesterase in field workers is 1.5 ug/cm<sup>2</sup>.

## c. Conclusion

1. Classification of Data - Minimum
2. A safe level for foliar residues of methomyl that are not likely to inhibit cholinesterase in field workers is  $1.5 \text{ ug/cm}^2$  of skin area.
3. Dislodgeable foliar residues level was reported not to exceed  $2.0 \text{ ug/cm}^2$  after the spray has dried.
4. "A 48 hour reentry interval is appropriate in corn, citrus, peaches, nectarines, grapes, and apples while a 24 hour safety interval is appropriate for all other crops".

Dermal Absorption - Rat  
Dept. of Entomology, University of Calif.  
Iwata, Yutaka et al., 1983 Acc. No. 251602

## A. Procedure

One ml of test material in acetone was applied to a  $25 \text{ cm}^2$  clipped area of the back of male albino rats weighing between 220 to 240 grams. Four animals per dosage were treated with eight control animals used per test material. Carbofuran was applied at 50, 100, 200 and  $800 \text{ ug/cm}^2$ . Carbosulfan was applied at 50, 100, 200 and  $400 \text{ ug/cm}^2$ . Hydroxy-carbofuran was applied at 200, 400 and  $800 \text{ ug/cm}^2$ . After 24 hours the animals were sacrificed for blood cholinesterase determinations. Parathion, with reference to the literature for exposure data, was used as a reference standard to determine the safe levels. The total body surface area for the rat was reported to be  $325 \text{ cm}^2$ .

## B. Results

1. Red cell cholinesterase inhibition (50%) after 24 hour exposure to  $25 \text{ cm}^2$  of treated skin.
  - a. Carbofuran  $\text{ED}_{50}$   $85.8 \text{ ug/cm}^2$ .
  - b. Carbosulfan  $\text{ED}_{50}$   $101.4 \text{ ug/cm}^2$ .
  - c. 3-hydroxycarbofuran  $\text{ED}_{50}$   $447.2 \text{ ug/cm}^2$ .

2. Safe level on foliage in  $\text{ug/cm}^2$  of total body surface exposed.
  - a. Reference standard safe level was reported to be  $0.09 \text{ ug/cm}^2$  for parathion.
  - b. Safe level on foliage that is not likely to inhibit cholinesterase.
    - i. Carbofuran  $0.3 \text{ ug/cm}^2$
    - ii. Carbosulfan  $0.3 \text{ ug/cm}^2$
    - iii. 3-hydroxycarbofuran  $1.3 \text{ ug/cm}^2$
  - c. Conclusion
    1. Classification of Data - Minimum
    2. Calculated safe level, that are not likely to inhibit cholinesterase in field workers, for the combined residues of carbosulfan, carbofuran and 3-hydroxycarbofuran is  $0.31 \text{ ug/cm}^2$  of skin area.
    3. Maximum amount of carbofuran residue level on foliage was reported to be  $0.16 \text{ ug/cm}^2$ .
    4. A reentry interval of 7 days was proposed for citrus grown in California.

#### Incidence of Farm Worker Ingestion of Oxamyl

"During the past three years we have (State of California) received seven confirmed reports of illness due to ingestion of Vydate (oxamyl). All of these incidents have resulted from farm field workers drinking from drip irrigation systems containing a solution of Vydate in water. There was one case reported in 1981, four in 1982, and two in 1983 to date. All of these incidents occurred in tomato fields in San Diego County."

After a review of these reports it is apparent that in each incident the workers were warned either verbally or by signs posted or by both, prior to the ingestion incident of the presence of pesticides in the irrigation system.

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