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05/OPP # 34147
Nicole Pagani

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MEMORANDUM

**SUBJECT: OCCUPATIONAL AND RESIDENTIAL EXPOSURE ASSESSMENT
AND RECOMMENDATIONS FOR THE REREGISTRATION
ELIGIBILITY DECISION DOCUMENT FOR TEMEPHOS**

FROM: Jonathan Becker, Ph.D., Environmental Health Scientist
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for J. Becker

TO: Larry Schnaubelt
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THRU: Alan Nielsen, Senior Scientist
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Al Nielsen

Please find attached the occupational and residential exposure assessment for Temephos. This chapter uses a streamlined format.

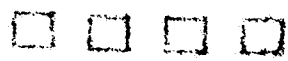
DP Barcode: 240191

Pesticide Chemical Codes: 059001

EPA Reg Nos: 228-107, 228-118, 228-121, 228-122, 769-678, 769-722, 769-723, 769-724, 769-725, 8329-15, 8329-16, 8329-17, 8329-30, 48273-9, 48273-10, 66733-9, 66733-10, 66733-11.

EPA MRID No.: N/A

PHED: Yes, Version 1.1



Temephos

This is an abbreviated occupational exposure and risk assessment for temephos.

I. Hazard Identification

Table 1 summarizes the critical toxicological information from the Temephos Hazard ID memo (dated 12 May 1998).

Table 1. Temephos hazard endpoints and uncertainty factors.

Route / Duration	NOEL (mg/kg/day)	Endpoint	Study	Uncertainty Factors	Comments
Short-term Dermal	0.3	Plasma ChE inhibition	Subchronic feeding study in Rats (MRID # 00001239)	Interspecies: 10x Intraspecies: 10x FQPA: None	100 percent dermal absorption assumed.
Short-term Inhalation					No inhalation study is available. Exposure is converted to an oral equivalent dose, combined with the dermal dose, and compared to the oral endpoint.
Intermediate-term and Chronic Dermal					Same endpoint chosen for intermediate-term and chronic as for short-term. See comments above.
Intermediate-term and Chronic Inhalation					No inhalation study available. See comments above.

Temephos is not classified as a carcinogen. Based on the technical formulation, acute oral and dermal toxicity are category II, acute inhalation toxicity is category III, primary eye irritation is category III, and skin irritation is category IV. Temephos is not a dermal sensitizer.

II. Exposure Characterization

Temephos is a restricted use pesticide formulated as a granular (1 to 5 percent active ingredient) and as an emulsifiable concentrate (40 to 45 percent active ingredient). It is used to control mosquito larvae in standing water (tidal areas, woodland pools, shallow ponds, tire and refuse piles). It can be applied by fixed-wing aircraft, helicopter, hand-held sprayers, power backpack blowers, and by spoon. Application rates are based on the organic content of the standing water being treated and range up to 0.5 lb ai per acre. Areas can be treated multiple times per year, as needed.

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Potential occupational exposure routes are dermal and inhalation and may be of short-term (1 to 7 days), intermediate-term (1 week to several months), and chronic durations (more than several months). The largest United States end user of temephos (Lee County Mosquito Control District, Florida) reports that in a "typical" year they apply temephos 5 to 6 days per week from May through October and possibly 2 days per week for the rest of the year (about 160 applications per year). Variation in amount of rainfall in a specific geographical region can greatly prolong or shorten the seasonal duration of required mosquito larvicide treatments. There are no homeowner uses of temephos.

III. Occupational Exposure and Risk Assessment

Application Rates: Temephos may be applied up to 0.5 lbs a.i. per acre.

Submitted Studies: HED is not aware of any handler exposure study submitted to the Agency for review.

Handler Exposure Scenarios: HED has identified the potential for occupational exposure for 14 major scenarios, as follows: (1) mixing / loading liquids for aerial application; (2) mixing / loading liquids for rights-of-way sprayer; (3) loading granulars for aerial application; (4) applying liquids using fixed-wing aircraft; (5) applying liquids using helicopter; (6) applying liquids using rights-of-way sprayer; (7) applying granulars using fixed-wing aircraft; (8) applying granulars using helicopter; (9) flagging during aerial application of liquid sprays; (10) flagging during application of granulars; (11) mixing / loading / applying sprays with a backpack sprayer; (12) loading / applying granulars with a power backpack blower; (13) loading / applying granulars with belly grinder; and (14) applying granulars by spoon.

Occupational handler dermal and inhalation exposures for all durations (developed using PHED Version 1.1 surrogate data) are presented in the attached spreadsheet. The assumptions and the formulae that were used in the exposure / risk calculations are as follows:

- $\text{Daily exposure (mg/day)} = \text{Unit exposure (mg/lb ai)} * \text{Application rate (lb ai/acre)} * \text{Acres treated.}$
- $\text{Daily dose (mg/kg/day)} = \text{Daily exposure (mg/kg)} / \text{Body weight (70 kg).}$
- $\text{MOE} = \text{NOEL (mg/kg/day)} / \text{Daily dose (mg/kg/day).}$
- Body weight for an adult handler is assumed to be 70 kg.
- PHED clothing and risk mitigation scenarios are as follows: Baseline - long sleeved shirt, long pants, no respirator; Maximum PPE - coveralls over long pants, long sleeved shirt, chemical-resistant gloves, organic vapor respirator; Engineering Controls - long pants, long sleeved shirt, no gloves in an enclosed cab or cockpit, closed mixing/loading.

Handler Exposure Scenario Results: Results for the occupational handler scenarios are presented in the attached spreadsheet and are summarized below in Table 2.

Table 2. Highest estimated MOE for each temephos exposure scenario for all exposure durations.

Exposure Scenario	Range of MOEs		
	Baseline	Maximum PPE	Engineering Controls
Mixer/Loader			
Mixing / loading liquids for aerial application	0.02 - 0.04	3.5 - 7.0	7 - 14
Mixing / loading liquids for rights-of-way sprayer	0.36	61	121
Loading granulars for aerial application	5.9 - 12	17 - 34	290 - 590
Applicator			
Applying liquids using fixed-wing aircraft	No data	Scenario not feasible	12 - 24
Applying liquids using helicopter	No data	Scenario not feasible	32 - 63
Applying liquids using rights-of-way sprayer	0.81	3.6	Scenario not feasible
Applying granulars using fixed-wing aircraft	No data	Scenario not feasible	21- 41
Applying granulars using helicopter	No data	Scenario not feasible	No data
Flagger			
Flagging during aerial application of liquid sprays	5.3 - 11	6 - 12	260 - 530
Flagging during application of granulars	20 - 41	37 - 74	1000 - 2000
Mixer/Loader/Applicator			
Mixing / loading / applying sprays with a backpack sprayer	3.3	5.2	Scenario not feasible
Loading / applying granulars with a power backpack blower	No data	No data	Scenario not feasible
Loading / applying granulars with belly grinder	0.83	1.0	Scenario not feasible
Applying granulars by spoon (by hand used as a surrogate)	26	46	Scenario not feasible

Postapplication Exposure Scenarios: HED believes that postapplication exposures would be minimal. This belief is based on the low application rate (0.5 lb ai per acre) of temephos, the short duration spent by the worker in a treated area (typically a few minutes), and the low exposure activity of the worker (typically dipping water from a temporary pool with a long handled dipper and examining the collected water for mosquito larvae).

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IV. Residential Exposure Assessment

Residential Handler Exposure: There are no residential uses of temephos. Because of the areas in which temephos is aerially applied (e.g., tidal marshes) and the presumed large droplet size of the spray, it is unlikely that significant exposure via spray drift would occur. However, because of the diversity of sites that temephos may be used, HED remains concerned that bystander spray drift exposure may occur in some situations. HED reserves the decision concerning the magnitude of bystander spray drift exposure and the required buffer zone until data can be supplied.

Residential Postapplication Exposure: Although temephos may be used in areas (e.g., temporary pools along the side of the road, standing water in discarded tires, and refuse piles) that may occasionally be visited by the general population, HED believes that it is unlikely that significant postapplication exposure would occur. This belief is based on the low application rate, the likelihood of a brief duration spent in such environments, and the probability of low exposure activities of the residents.

V. Incident Data

Incident data will be provided by Jerry Blondell, OPP/HED/CEB2.

VI. Conclusions

Based on the above occupational exposure and risk assessment, HED concludes:

- The use of risk mitigation measures for occupational handlers (i.e., maximum PPE and engineering controls) results in **MOEs greater than 100** for the following scenarios: mixing / loading liquids for rights-of-way sprayer, loading granulars for aerial application, and flagging during aerial application of granulars and liquid sprays.
- The use of risk mitigation measures for occupational handlers (i.e., maximum PPE and engineering controls) results in **MOEs less than 100** for the following scenarios: mixing / loading liquids for aerial application, applying liquids using fixed-wing aircraft, applying liquids using helicopter, applying liquids using rights-of-way sprayer, applying granulars using fixed-wing aircraft, mixing / loading / applying sprays with a backpack sprayer, loading / applying granulars with belly grinder, and applying granulars by spoon.
- Two scenarios lack exposure data that are needed to assess risk to temephos handlers. These scenarios are applying granulars using a helicopter and loading / applying

granulars with a power backpack blower. A power backpack blower is frequently the method of choice for applying granulars to tire piles.

- HED remains concerned that bystander spray drift exposure may occur in some situations and requests supporting data concerning bystander spray drift exposure from the registrant.

VII. Summary

Temephos, formulated as a granular and as an emulsifiable concentrate, is a restricted use pesticide used as an insecticide for the control of mosquito larvae. Based on HED's occupational and risk assessment, MOEs are less than 100 for many of the commonly used exposure scenarios. Exposure scenarios with MOEs greater than 100 include mixing / loading liquids for rights-of-way sprayer, loading granulars for aerial application, and flagging during aerial application of granulars and liquid sprays. Two exposure scenarios could not be assessed because of the lack of exposure data. HED also requests supporting data concerning bystander spray drift exposure from the registrant.

Because the default assumption of 100 percent dermal absorption was used in this assessment, many of the calculated MOEs are less than 100. If the registrant has dermal absorption data, and if the Agency reviews and accepts these data, this assessment could be further refined and it is likely that the MOEs would be substantially greater.

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cc: Nicole Paquette (OPP/HED/RRB2)
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