METHAMIDOPHOS

Task 2: Topical Discussions

Contract No. 68-01-5830

Final Report

December 9, 1981

SUBMITTED TO:

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Arlington, Virginia 22202

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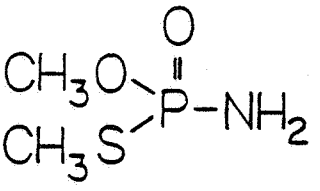

O,S-Dimethyl phosphoramidothioate

Data requirements are cited from EPA's Guidelines for Registering Pesticides (1981).

(1) DEGRADATION 163.161

(A) Hydrolysis 163.161-1

Hydrolysis data are required to support the registration of each end-use product intended for outdoor use or aquatic impact use, and each manufacturing-use product that may legally be used to formulate such an end-use product.

Three hydrolysis studies were reviewed and were considered invalid because the use of dark controls was not specified.

A study by Magee (00014039) contains valid data on methamidophos degradation products; however, due to the deficiencies in the protocols, the mechanisms by which these compounds originated cannot be determined. The identified compounds are: methanol, methyl mercaptan, O-methyl phosphoric acid, S-methyl phosphorothioate, and ammonia.

Data Gaps w/o mechanisms it's hard to say their identities are correct.

All data specified in Section 163.161-1 are needed to assess the hydrolysis properties of methamidophos.

Reference

Magee, P.S. 1966. Hydrolysis of Monitor insecticide. (Unpublished study received Mar. 5, 1970 under OF0956; submitted by Chevron Chemical Co., Richmond, CA; CDL:093263-C) (00014039)

(B) Photodegradation in Water 163.161-2

A photodegradation study in water is required to support the registration of each end-use product intended for terrestrial (except greenhouse and domestic outdoor), aquatic, and forestry use and for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

One study on the photodegradation of methamidophos in water was reviewed and was considered invalid.

Data Gaps

All data specified in Section 163.161-2 are needed to assess the photodegradation of methamidophos in water.

(C) Photodegradation on Soil 163.161-3

Photodegradation studies on soil surfaces are required to support the registration of each end-use product intended for orchard crop use, field and vegetable crop use, or forestry use. Such studies are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product. However, uses involving injection of the product into the soil or incorporation of the product into the soil upon application are not subject to the requirements of this section.

No data on the photodegradation of methamidophos on soil are available.

Data Gaps

All data specified in Section 163.161-3 are needed to assess the photodegradation of methamidophos on soil.

(D) Photodegradation in Air 163.161-4

A laboratory photodegradation study in the vapor phase will be required on a case-by-case basis to support the registration of an end-use product with orchard or field and vegetable crop uses that involve potentially significant exposure to workers. Data from such a study will also be required to support the registration of a manufacturing-use product which legally could be used to make such an end-use product. The Agency will make an assessment of what constitutes a significant inhalation exposure to workers based on the information required by Section 163.163-2(b)(2).

No data on the photodegradation of methamidophos in air are available.

Data Gaps

All data specified in Section 163.161-4 are needed to assess the photodegradation of methamidophos in air.

(2) METABOLISM 163.162

Data on metabolism are required to determine the nature and availability of pesticide residues to rotational crops and to help in the assessment of potential disposal and reentry hazards.

(A) Aerobic Soil 163.162-1

An aerobic laboratory soil metabolism study is required to support the registration of each end-use product intended for terrestrial or forestry use. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

Five aerobic soil metabolism studies were reviewed and four were considered valid.

uncertain results

Methamidophos at 20 ppm had a half-life of 10-12 days in a sandy loam soil at 24 C (Tucker, 00014991); the degradation rate was enhanced by increased moisture content. Methamidophos at 1 ppm had half-lives of 2-6 days in silt, loam, and sandy soils at 21 C (Leary and Tutass, 00014076). When [S-methyl-^{14}C]methamidophos degradation was studied in silt soil at 37 C, >90% of the applied ^{14}C had dissipated from silt soil 1 week after application at 0.221 ppm (Leary and Tutass, 00014076). In another study, methamidophos levels declined by ~50% (from 1.3 ppm) within 9 days after the last of three applications to a sandy loam soil over a 33-day period at room temperature (Tucker, 00014497). — not conducted long enough

Half-life established 4 soils Temp too high

[S-methyl-^{14}C]Methamidophos was metabolized to radiolabeled amino acids and carbohydrates within 64 hours in a silt soil at 21 and 37 C (Leary and Tutass, 00014076). A study by Lubkowitz (05017379) contains invalid quantitative data on the decline and accumulation of methamidophos and its products; but the study does contain valid data on degradation

products formed in soil. The following products were identified in three types of soils incubated with methamidophos at 22 C: O,S-dimethyl phosphorothioate, S-methyl phosphoroamidothioate, O-methyl phosphoroamidate, O-methyl phosphoric acid, and phosphate ion.

Data Gaps

All data specified in Section 163.162-1 are needed to assess the aerboic soil metabolism of methamidophos.

Studies were not precisely per Guidelines but combined I believe the data tell enough, especially since metabolism is so rapid. ITB 12-23-81

References

Leary, J.B., and H.O. Tutass. 1968. Degradation of Monitor insecticide in soil. (Unpublished study received Mar. 5, 1970 under OF0956; submitted by Chevron Chemical Co., Richmond, CA; CDL:093264-AN) (00014076)

Lubkowitz, J.A. 1975. Uptake and degradation of methamidophos by tomato plants and soils. in Origin and fate of chemical residues in food, agriculture and fisheries, p. 157-163. Proceedings and report of two research coordination meetings; 1973, 1974, Vienna, Austria. (05017379)

Tucker, B.V. 1972. Orthene soil metabolism - laboratory studies. (Unpublished study, including supplement, received Feb. 23, 1972 under 2G1248; submitted by Chevron Chemical Co., Richmond, CA; CDL:091774-Z) (00014991)

Tucker, B.V. 1972. Residues in earthworms in Orthene and Ortho 9006 treated soil. (Unpublished study prepared by Chevron Chemical Co., Richmond, CA) (00014497)

(B) Anaerobic Soil 163.162-2

An anaerobic soil metabolism study is required to support the registration of each end-use product intended for field or vegetable crop use. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make

such an end-use product. However, an anaerobic soil metabolism study shall not be required if an anaerobic aquatic metabolism study has been conducted in accordance with the requirements of Section 163.162-3.

One anaerobic soil metabolism study was reviewed and considered valid.

Leary and Tutass (00014076) incubated [S-methyl-^{14}C]methamidophos anaerobically in silt soil at 37 C, and found that 8% of the applied ^{14}C had dissipated in a volatile form after 3 days.

Data Gaps

Not run sufficiently long enough to establish decline curve. Non half life no identity of residues

All data specified in Section 163.162-2 are needed to assess the anaerobic soil metabolism of methamidophos.

Reference

Leary, J.B., and H.O. Tutass. 1968. Degradation of Monitor insecticide in soil. (Unpublished study received Mar. 5, 1970 under 0F0956; submitted by Chevron Chemical Co., Richmond CA; CDL:093264-AN) (00014076)

(C) Anaerobic Aquatic 163.162-3

An anaerobic aquatic metabolism study is required to support the registration of each end-use product intended for aquatic use, forestry use, or for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product. The anaerobic soil metabolism study in Section 163.162-2 may not be substituted for this study.

No data on the anaerobic aquatic metabolism of methamidophos are available.

No data on the anaerobic aquatic metabolism of methamidophos are required because methamidophos is not intended for aquatic use, forestry use, or any use that results in direct discharges into the aquatic environment.

(D) Aerobic Aquatic 163.162-4

An aerobic aquatic metabolism study is required to support the registration of each end-use product intended for aquatic use or for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the aerobic aquatic metabolism of methamidophos are available.

No data on the aerobic aquatic metabolism of methamidophos are required because methamidophos is not intended for aquatic use or for any use that results in direct discharge into the aquatic environment.

(3) MICROBIOLOGICAL

The requirement for the submission of microbiological data is currently being reserved.

(A) Effects of Microbes on Pesticides

Two studies on the effects of microbes on pesticides were reviewed and one was considered valid.

Leary and Tutass (00014076) demonstrated that microorganisms participate in methamidophos degradation in soil; ~10% of the ^{14}C applied as [S-methyl-^{14}C]methamidophos had dissipated in a volatile form after 1 week in sterile soil, versus >90% in nonsterile soil.

Reference

Leary, J.B., and H.O. Tutass. 1968. Degradation of Monitor insecticide in soil. (Unpublished study received Mar. 5, 1970 under OF0956; submitted by Chevron Chemical Co., Richmond, CA; CDL:093264-AN) (00014076)

(B) Effects of Pesticides on Microbes

Five studies on the effects of pesticides on microbes were reviewed and were considered valid. Four studies were combined into two reviews.

Methamidophos at 200-6,400 ppm and 200-400 ppm did not markedly affect the in vitro growth of Aspergillus sp. and Penicillium sp., respectively (Zidan and Ramadan, 05017741). Growth of Penicillium sp. was noticeably inhibited (quantitative data not available) by methamidophos at ≥800 ppm. In a study by Focht and Joseph (00015233 and 05017226), repeated applications (three times over a 36-day period) of methamidophos, at 20 ppm each, may have reduced fungal populations and nitrification rates, and increased sulfate levels in some soils. However, the effects

were not seen in all soils studied (three types), and the data did not permit unequivocal conclusions about the effects of methamidophos on microbes. Bacterial populations (including actinomycetes) and ammonification, respiration, and sulfur oxidation rates were not affected by the treatments. Ramadan and Zidan (05019841 and 05019842) found that treatment of soil with methamidophos (under actual use conditions) caused a temporary inhibition of growth of most types of soil microbes. Total microbial flora, fungi, aerobic cellulose decomposers, and aerobic and anaerobic nitrogen fixers, were inhibited for ≤2 weeks after treatment with methamidophos. Nitrifying bacteria were inhibited for at least 4 weeks. All populations recovered and generally reached higher levels than in untreated soil, except for actinomycetes which were slightly below control levels for 3 months after treatment. Anaerobic cellulose decomposers were markedly stimulated by methamidophos treatment.

References

Focht, D.D., and H.A. Joseph. 1969? Microbial activity in soils treated with acephate and its major degradation product. (Unpublished study received Mar. 27, 1973 under 239-EX-60; prepared by Univ. of California at Riverside, Dept. of Soil Science and Agricultural Engineering, submitted by Chevron Chemical Co., Richmond, CA; CDL: 223489-Q) (00015233)

Focht, D.D., and H. Joseph. 1974. Microbial activity in soils treated with acephate and Monitor. J. Environ. Qual. 3(4):327-328. (05017226)

Ramadan, E.M., and Z.H. Zidan. 1977. Influence of certain organophosphorus insecticides on soil microflora. 1. Total microbial flora, actinomycetes, fungi, yeasts, and cellulose decomposers. Ann. Agric. Sci. 20(2):57-63. (05019842)

Ramadan, E.M., and Z.H. Zidan. 1977. Influence of certain organophosphorus insecticides on soil microflora. 2. Nonsymbiotic nitrogen

fixers and nitrifying bacteria. Ann. Agric. Sci. 20(2):65-71. (05019841)

Zidan, Z.H., and E.M. Ramadan. 1976. Degradation of some organophosphorus insecticides by fungi. Egyp. J. Microbiol. 11(½):93-98. (05017741)

(C) Activated Sludge

No data on the activated sludge metabolism of methamidophos are available.

(4) MOBILITY 163.163

The movement of pesticide residues by means of leaching through the soil may cause contamination of food, result in a loss of usable land and water resources to man due to contamination of groundwater supplies, or cause habitat loss to wildlife. Therefore, studies are required to ascertain the extent of pesticide leaching through soil, which, in turn, provides a basis for assessing the mobility potential of a pesticide.

(A) Leaching 163.163-1

Data are required to support the registration of each end-use product intended for domestic outdoor use, greenhouse use, terrestrial non-crop use, orchard crop use, field or vegetable crop use, forestry use, aquatic use, and aquatic impact use involving direct discharge only. Such data are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

For terrestrial non-crop uses, orchard crop uses, field or vegetable crop uses, and forestry uses, the mobility of the test substance and its degradates in soil shall be assessed either by soil thin-layer chromatography, soil column, or batch equilibrium (adsorption/desorption). For domestic outdoor uses, greenhouse uses, aquatic uses, and aquatic impact uses, the mobility of the test substance and its degradates in soil shall be assessed only by batch equilibrium (adsorption/desorption).

Four studies containing leaching data were reviewed and two were considered valid.

In a soil thin-layer chromatography (TLC) study (Thornton et al., 00029887), [^{14}C]methamidophos had R_f values of 0.91-0.98 (very mobile) in sand, sandy loam, sandy clay loam, silt loam, and silty clay loam

soils (soil characteristics shown in Table 1). In another soil TLC study (Tucker, 00014992), [^{14}C]methamidophos had R_f values of 0.61-0.88 (mobile) in loam, silty clay loam, and three clay soils, 0.56 (moderately mobile) in a sandy clay loam, and 1.00 (very mobile) in a loamy sand.

The soil TLC studies partially satisfy data requirements in Section 163.163-1 by demonstrating that unaged residues of methamidophos can be expected to be moderately mobile to very mobile in most types of soils.

Data Gaps

A degradate mobility study using aged residues as described in Section 163.163-1 is needed to assess the leaching potential of methamidophos degradation products.

References

Thornton, J.S., J.B. Hurley, and J.J. Obrist. 1976. Soil thin-layer mobility of twenty-four pesticide chemicals: Report No. 51016. (Unpublished study received Jan. 28, 1980 under 5F1547; submitted by Mobay Chemical Corp., Pittsburgh, PA; CDL:099216-I). (00029887)

Tucker, B.V. 1972. Orthene leaching in soil. (Unpublished study including supplementary report, received Feb. 23, 1972 under 2G1248; submitted by Chevron Chemical Co., Richmond, CA; CDL:091774-AA). (00014992)

(B) Laboratory Volatility 163.163-2

A laboratory volatility study will be required on a case-by-case basis to support the registration of each end-use product intended for commercial greenhouse, orchard, or field and vegetable crop uses that involve significant inhalation exposure to workers. Data from such a

Table 1. Characteristics of soils used in a methamidophos soil TLC mobility stidy.

Texture	Sand (%)	Silt (%)	Clay (%)	Organic matter (%)	pH
Sand	92	1	7	0.8	5.9
Sandy loam	74	14	13	2.8	6.6
Sandy clay loam	56	21	23	0.6	5.5
Silt loam	18	57	25	5.1	7.9
Silty clay	4	53	43	2.1	6.7
Silty clay	0	41	59	0.5	6.0

From Thornton et al. (00029887).

study will also be required to support the registration of each manufacturing-use product which legally could be used to make any end-use product for which laboratory volatility data are required.

No data on the volatility of methamidophos under laboratory conditions are available.

Data Gaps

All data specified in Section 163.163-2 are needed to assess the volatility of methamidophos under laboratory conditions.

(C) Field Volatility 163.163-3

A volatility study conducted on-site in a commercial greenhouse and/or in the field will be required on a case-by-case basis only for those pesticides that the Agency considers pose a potentially significant inhalation exposure to workers (see Section 163.163-2(b)) and, based on the results of the laboratory study described in Section 163.163-2, that also demonstrate, in the Agency's opinion, a significant rate of volatilization from soil.

No data on the field volatility of methamidophos are available.

Data Gaps

All data specified in Section 163.163-3 are needed to assess the volatility of methamidophos under field conditions.

(5) DISSIPATION 163.164

(A) Field Dissipation - Terrestrial 163.164-1

A terrestrial field dissipation study is required to support the registration of each end-use product intended for any terrestrial use (except greenhouse use). Such data are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the terrestrial field dissipation of methamidophos are available.

Data Gaps

All data specified in Section 163.164-1 are needed to assess the terrestrial field dissipation of methamidophos.

(B) Field Dissipation - Aquatic and Aquatic Impact 163.164-2

An aquatic field dissipation study is required to support the registration of each end-use product intended for aquatic food crop uses, aquatic non-crop uses, and for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the aquatic field dissipation of methamidophos are available.

No data on aquatic field dissipation are required because methamidophos is not intended for aquatic use or any use that results in direct discharges into the aquatic environment.

(C) Dissipation - Forestry 163.164-3

Field dissipation studies for forestry uses are required to support the registration of each end-use product intended for forestry use and of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the dissipation of methamidophos in forests are available.

No data on the dissipation of methamidophos in forests are required because the use pattern indicates that introduction of methamidophos into a forest environment would not occur.

(D) Dissipation - Combinations and Tank Mixes 163.164-4

A laboratory or field soil dissipation study may be required on a case-by-case basis to support the registration of an end-use product containing more than one active ingredient, intended for use as a component in tank mixtures, or customarily applied serially with another pesticide product.

No data on the dissipation of multiple active ingredient formulations of methamidophos are available.

Data requirements for combinations and tank mixes containing methamidophos are not cited here bceause this standard deals only with the single active ingredient.

(E) Dissipation - Long Term 163.164-5

A long-term soil dissipation study will be required to support the registration of the end-use products of any pesticide that has been shown not to readily dissipate in a soil environment. Such a study may also be required to support the registration of any manufacturing-use product that legally could be used to make such an end-use product.

No data on long-term dissipation of methamidophos in soil are available.

No data are required on the long-term dissipation of methamidophos because methamidophos readily dissipates in a soil environment, as determined from the data presented in Sections 163.162-1 and 163.163-1.

(6) ACCUMULATION 163.165

(A) Confined Accumulation - Rotational Crops 163.165-1

Confined accumulation studies on rotational crops are required to support the registration of each end-use product intended for field or vegetable crop use, aquatic crop use, or use on any other site on which it is reasonably forseeable that any food or feed crop may be produced after application of a pesticide. Such studies are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the confined accumulation of methamidophos in rotational crops are available.

Data Gaps

All data specified in Section 163.165-1 are needed to determine whether methamidophos will accumulate in rotational crops.

(B) Field Accumulation - Rotational Crops 163.165-2

A field accumulation study to determine the uptake of soil residues by rotational crops is required when (1) the confined accumulation study (Section 163.165-1) identifies the ^{14}C residues in the crop as either parent compound, closely-related degradates, metabolites, and/or their conjugates or (2) a subsequent crop is treated with the same active ingredient as the initial crop.

No data on the field accumulation of methamidophos in rotational crops are available.

Data Gaps

All data specified in Section 163.165-2 are needed to determine

whether methamidophos will accumulate in rotational crops under field conditions.

(C) Accumulation - Irrigated Crops 163.165-3

A study of residue accumulation in irrigated crops under actual field use conditions is required to support the registration of each end-use product intended for aquatic food crop or aquatic non-crop uses, for uses in and around holding ponds used for irrigation purposes, or for uses that involve effluents and other discharges which in turn are used to irrigate crops. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the accumulation of methamidophos in irrigated crops are available.

No data on the accumulation of methamidophos in irrigated crops are required because the use pattern indicates that crops are not irrigated with methamidophos-treated water.

(D) Laboratory Studies - Fish 163.165-4

A fish accumulation study is required to support the registration of each end-use product intended for outdoor use (except domestic outdoor and greenhouse uses), or aquatic impact use resulting in direct discharge into aquatic environments, and for each manufacturing-use product that legally could be used to produce such a product, except when the criteria below are satisfied.

Fish accumulation data will not normally be required in situations where the registrant can offer acceptable evidence showing that the active ingredient and/or its principal degradation product(s):

- Will not reach water, or
- Will not persist in water (i.e., a half-life of approximately 4 days or less) and has properties suggesting:

- A relatively low potential for accumulation in fish (i.e., an octanol/water partition coefficient less than ∿1,000) or
- A lack of accumulation in the organs and tissues of mammals or birds.

Two fish accumulation studies were reviewed and were considered valid.

One study was reported under four MRIDs (Stanley, 00014014 and 00014018; Chemagro Corporation, 00014017 and 00014019). In this study, too few samples were taken to adequately determine the accumulation potential of methamidophos. Methamidophos at 0.01 ppm had a bioaccumulation factor of <2 in bass on the 8th day of exposure in a static system without sediments. The other study was reported under two MRIDs (Baychem Corporation, 00014015 and 00014016). Bass exposed to methamidophos at 0.8-1.5 ppm over a 28-day period did not accumulate the parent compound. The maximum bioaccumulation factor observed was 0.09. Depuration to nonquantifiable levels (<0.014 ppm) occurred on the 1st day of depuration.

These data indicate that methamidophos has little potential for accumulation in fish. Methamidophos is very soluble in water (Farm Chemicals Handbook,1981, Meister Publishing Co., Willoughby, OH) and therefore should have a low octanol/water partition coefficient. No further data on the accumulation of methamidophos in fish are needed.

References

Baychem Corporation. 1972. Chemagro, Division of Baychem Corporation. Residue experiment: Report No. 31933. (Unpublished study prepared by Baychem Corp.). (00014015)

Baychem Corporation. 1972. Chemagro, Division of Baychem Corporation. Residue experiment: Report No. 31938. (Unpublished study received on

unknown date under OF0956; submitted by Chevron Chemical Co., Richmond, CA; CDL:093266-H). (00014016)

Chemagro Corporation. 1971. Recovery of Monitor from bass and rainbow trout: Report No. 30,976. Dated Sept. 30, 1971. (Unpublished study prepared by Baychem Corp.). (00014017)

Chemagro Corporation. 1971. Recovery of Monitor from bass and rainbow trout: Report No. 30,977. Dated Sept. 30, 1971. (Unpublished study prepared by Baychem Corp.). (00014019)

Stanley, C.W. 1971. A gas chromatographic method for the determination of Monitor in fish and water: Report No. 30975. Dated Sept. 30, 1971. (Unpublished study received on unknown date under OF0956; prepared by Baychem Corp., submitted by Chevron Chemical Co., Richmond, CA; CDL: 093266-J). (00014018)

Stanley, C.W. 1971. Analysis of bass and water for Monitor: Report No. 30979. (Unpublished study received on unknown date under OF0956; prepared by Baychem Corp; submitted by Chevron Chemical Co., Richmond, CA; CDL:093266-F). (00014014)

(E) Field Accumulation - Aquatic Non-Target 163.165-5

Field accumulation studies in aquatic non-target organisms are required to support the registration of each end-use product:

- Which is intended for forestry use, aquatic non-crop use, or aquatic impact use that results in direct discharges;
- For which data from a laboratory fish accumulation study are required by Section 163.165-4; and
- For which no tolerance or action level for fish has been granted.

Such studies are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

Two studies on the accumulation of methamidophos in aquatic non-target organisms were reviewed and were considered valid.

Methamidophos exhibited a low accumulation potential in Daphnia magna (Tucker, 00015242) and the marine diatom, Cylindrotheca fusiformis (Tucker, 00014496). ^{14}C residues had a bioaccumulation factor of ∿2 in D. magna exposed to [^{14}C]methamidophos at 0.1 ppm. Methamidophos exhibited a bioaccumulation factor of <2 in C. fusiformis on the 7th day of exposure to methamidohpos at 1-10 ppm.

No data on the accumulation of methamidophos are required because methamidophos is not intended for forestry use, aquatic uses, or aquatic impact uses that result in direct discharges.

References

Tucker, B.V. 1972. Residues of Orthene and Ortho 9006 in a marine diatom growing in treated water. (Unpublished study received Aug. 7, 1972 under 239-2406; submitted by Chevron Chemical Co., Richmond, CA; CDL:001571-U). (00014496)

Tucker, B.V. 1973. Orthene and Ortho 9006 in Daphnia magna living in treated water. (Unpublished study prepared by Chevron Chemical Co., Richmond, CA). (00015242)

(7) REENTRY (SUBPART K)

Reentry data may be required to support the registration of manufacturing-use and end-use methamidophos. Requirements will be decided on a case-by-case basis.