4-4-84
FISH TISSUE

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF

CASE GS0140 ALDICARB PM 300 09/29/82

CHEM 098301 Aldicarb (2-methyl-2-(methylthio)propi

BRANCH EEB DISC 35 TOPIC 05050043

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102053 CONTENT CAT 01

Romine, R.; Meeker, R. (1973) Accumulation of Aldicarb Residues in Fish Tissue from Chronic Exposure to Aldicarb, Aldicarb Sulfoxide and Aldicarb Sulfone in Aquaria Water: Project No. 111A13, File No. 19009. (Unpublished study received Dec 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL: 096670-K)

SUBST. CLASS = M; OTHER CHEMS: 110801 R07518

OTHER SUBJECT DESCRIPTORS
PRIM: EEB -40-05103043

DIRECT RVW TIME = (MH) START-DATE END DATE

REVIEWED BY: RICHARD R. STEVENS
TITLE: ECOLOGIST
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SIGNATURE: Richard R. Stevens DATE: 4/4/84

APPROVED BY:
TITLE:
ORG:
LOC/TEL:

SIGNATURE: DATE:

DATA EVALUATION RECORD

CHEMICAL: Aldicarb, Aldicarb sulfoxide and sulfone.

CITATION: Romine, R.; Meeker, R. (1973) Accumulation of Aldicarb Residues in Fish Tissue from Chronic Exposure to Aldicarb, Aldicarb Sulfoxide and Aldicarb Sulfone in Aquaria Water: Project No. 111A13; File No. 19009. (Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA CDL:096670-K) (00102053).

REVIEWED BY: Richard R. Stevens
Ecologist, EEB/HED
March 27, 1984

STUDY TYPE: Fish Residues
Bluegill (Lepomis macrochirus)

RESULTS:

"Bluegill sunfish were chronically exposed to equal-molar concentrations of aldicarb, aldicarb sulfoxide and aldicarb sulfone at total levels of 0.1 ppm and 0.01 ppm in aquaria water for up to 8 weeks. The fish exhibited no behavioral signs of toxicity at any time during the exposure. The appearance and feeding habits of the fish were normal, and there was no mortality.

"Total toxic aldicarb residues in the edible fish tissue equilibrated at 3X (0.03 ppm) and 4.5X (0.45 ppm) the water concentrations of 0.01 ppm and 0.1 ppm respectively within 7 days. When, after 4 weeks exposure, fish were transferred to clean water, the tissue residue dropped to one-tenth the original level within 7 days and to undetectable levels (<.02 ppm) within 21 days."

CONCLUSIONS: This study is judged sufficient to demonstrate the low bioaccumulative potential for aldicarb. The requirement for a fish accumulation study was waived by EAB due to the low octanol:water partition coefficient.

Materials/Methods

Test Procedures

"The purpose of the present study was to quantitate the total toxic aldicarb residue in bluegill sunfish following a prolonged exposure to low level concentrations of these residues in their aquaria water, and to determine the rate of tissue dissipation when fish were placed in clean water.

"The fish exposure portion of the study and the aquaria water analyses were performed under a contract agreement by Hazleton Laboratories, Vienna, Virginia. The fish tissue analyses were performed by the Union Carbide Agricultural Group's Residue Laboratory.

"Prior to the start of the chronic exposure, a preliminary 7-day pilot study was conducted at 0.1 ppm and 0.35 ppm to determine the degradation rate of the aldicarb residues in the aquaria and establish the test concentrations for the 8-week exposure. This preliminary 7-day pilot study is the same study as the "five-day" pilot study described in the attached Hazleton report. The exposure was designed as a 5-day preliminary study and careful monitoring was carried out by Hazleton for that period of time. However, the test was not completely terminated and all fish sacrificed until day 7. The 5 fish exposed to the 0.1 ppm showed no toxic symptoms. At 0.33 ppm, 4 of 5 fish were found dead after 5 days and the survivor was very sick. The 0.1 ppm concentration of toxic residues was therefore chosen as the top limit for the chronic exposure, and 0.01 ppm was chosen as the second concentration to achieve a 10-fold concentration difference.

"For the chronic exposure, bluegill sunfish were exposed to equal-molar concentrations of aldicarb sulfoxide, and aldicarb sulfone at total levels of 0.1 ppm and 0.01 ppm for up to 8 weeks. Two replicate aquaria were operated at each of the two exposure levels and one untreated control aquarium was included in the test. Thirty fish were placed in each of the five tanks for a total of 150 fish. During the first 4 weeks of the exposure, fish were removed from each tank at 7, 14, 16, 22 and 29 days after the initiation of the test for tissue analyses. After 4 weeks exposure, the remaining fish in one replicate aquarium at each exposure level were transfered to clean water for study of "wash-out" of tissue residues. The exposure of the fish in the other replicate tanks continued at the same exposure levels and without interruption to the termination of the study after a total of 8 weeks. During the second 4 weeks of the test, fish were removed from each tank on days 35, 42, 49 and 56 for tissue analyses."

"The methods for determination of toxic aldicarb residues in water and fish were developed by Union Carbide. In brief, these methods consist of extracting the total toxic aldicarb residues from fish and water and oxidizing any aldicarb and aldicarb sulfoxide to aldicarb sulfone with peracetic acid. After appropriate cleanup on a Florisil column the sample is analyzed by gas chromatography utilizing a flame photometric detector equipped with a filter selective for sulfur. Total toxic residue is quantitated in terms of aldicarb sulfone by reference peak height to a previously prepared calibration curve derived from injection of aldicarb sulfone standard solutions."

REPORTED RESULTS:

"The total toxic aldicarb residues in the fish tissue were determined for both the 7-day pilot study (Table 1) and the chronic exposure study (Table II). In the pilot study the 5 fish exposed at the 0.1 ppm level for 7 days (without mortality) were sacrificed and composited for analysis. The duplicate tissue analyses showed 0.22 ppm and 0.26 ppm total toxic residues for a 2.4X concentration factor. Three of the five fish exposed at 0.35 ppm died on day 2, one died on day 4 and one survived and was sacrificed on day 7 to terminate the exposure. Each of these fish was analyzed separately and tissue residues varied from 0.34 ppm on day 2 to 1.25 ppm for the lone survivor on day 7. The tissue residue at this exposure level shows a maximum residue concentration factor of 3.6X. The fish in this test evidently died from direct toxic effects of the aldicarb residues in the aquarium water and not because of any detrimental effects of the mild concentrative mechanism in the tissues. This is substantiated by the results from the eight week chronic exposure study (Table II). In this study the tissue residues during the full eight week exposure continuosly exceeded the residues in some of the dead fish from the pilot study with no apparent ill effect. Also, 7 day survivor in the 0.35 ppm pilot study had tissue residue about three times that of the fish which died at 2 days in the same aquarium.

"The chronic exposure of fish to non-lethal amounts of toxic aldicarb residues in their environmental water resulted in a 3X to 5X concentration of the residue in the fish tissue. Tissue residues in fish exposed to 0.1 and 0.01 ppm of aldicarb, aldicarb sulfoxide and aldicarb sulfone equilibrated at 0.45 ppm and 0.03 ppm respectively within 7 days. When the fish were transferred to clean water the level dropped to one-tenth the residue within one week and to undetectable levels (<.02 ppm) within 3 weeks."

"The results of the test show that aldicarb and its carbamate metabolites do not present a problem with regard to biomagnification, and that environmental hazards need be considered primarily as exposure to the acute toxicity of the pesticied. Low concentrations of aldicarb residues in water have no apparent biological effect on fish, and residues deposited in tissue from an accidental exposure are quickly disipated once the environment clears."

REVIEWRS EVALUATION:

This study was reviewed merely for corroboration of the theory that aldicarb should not bioaccumulate due to its low Kow. This study seems adequate to bear this out. For detailed descriptions of the equipment, experimental design and results, the reader is referred to hard copy.

TABLE I

PILOT EXPOSURE STUDY (7 DAY DURATION)

(5 FISH AT EACH CONCENTRATION)

Days Exposure	Number of Dead Fish		Total Toxic Residues In Fish Tissue	
	0.1 ppm	0.35 ppm	0.1 ppm	0.35 ppm
2	0	3	-	0.49*
				0.34
				0.34
4	0	1	-	1.03
7**	0	0	0.22	1.25
			0.26	

* Each of the three fish analyzed separately.

** Fish were sacrified - one survivor of the 0.35 ppm conc. and 5 survivors of the 0.1 ppm conc. Duplicate analyses were made on a composite of the 5 survivors.

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TABLE II

TOTAL TOXIC ALDICARB RESIDUES IN BLUEGILL SUNFISH (ppm) FROM CHRONIC EXPOSURE TO EQUAL-MOLAR CONCENTRATIONS OF ALDICARB, ALDICARB SULFOXIDE AND ALDICARB SULFONE

Sampling Date	Days Exposure	Total Exposure Levels and Aquaria Identification			
		0.1 ppm		0.01 ppm	
		Tank 1	Tank 2	Tank 3	Tank 4
12-11-72	7	0.45	0.47	0.022	0.034
12-18-72	14	0.55	0.44	0.028	0.030
12-20-72	16	0.53	0.47	0.032	0.022
12-26-72	22	0.46	0.45	0.029	0.026
1-2-73	29	0.43	0.42	0.027	0.032
			*		*
1-8-73	35	0.52	0.04	0.026	0.019
1-15-73	42	0.39	0.04	0.042	ND
1-22-73	49	0.41	ND	0.020	ND
1-29-73	56	0.28	ND	ND	ND

* Fish in Tanks 2 and 4 were placed in clean (aldicarb free) water on 1/2/73 immediately following sampling.

ND - No detectable residue, < 0.02 ppm

Residues calculated as aldicarb sulfone