

US EPA ARCHIVE DOCUMENT

DATA EVALUATION RECORD

(1) CHEMICAL: Trichlorfon

(2) TYPE OF FORMULATION: Unspecified

(3) CITATION: Pachecka, J., Sulinski, A., and Traczykiewicz, K.
1977. The effect of acute intoxication by dichlorvos and
trichlorphon on the activities of some rat brain esterases.
Neuropatol. Pol. 15:85-92

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(6) TOPIC: This study has information pertinent to discipline toxicology, topic biochemistry. It relates to none of the Proposed Guidelines data requirements.

(7) CONCLUSION: The administration of single doses of trichlorfon and dichlorvos (315 mg/kg and 40 mg/kg orally, respectively) to rats inhibited brain cholinesterase (ChE) activity by 85% within 15-60 minutes. Thereafter, activity recovered steadily to control levels by 48-72 hours. Brain acid and alkaline phosphatase activities were also measured, but only transient fluctuations representing an increase of up to 50% over control levels were noted.

CORE CLASSIFICATION: Not applicable

(8) MATERIALS AND METHODS: Trichlorfon and dichlorvos, obtained from the Polish Academy of Sciences (purity, etc., unspecified), was administered orally (vehicle unspecified) to an unspecified number of adult male albino rats (190-200 g). Doses were 50% of the LD₅₀; LD₅₀s were considered to be 630 mg/kg for trichlorfon and 80 mg/kg for dichlorvos. The animals were fed a commercial diet with water ad libitum then, at various times after dosing, they were decapitated and brain homogenates were prepared (Paczecka et al. 1975. Neuropatol. Pol. 13:455-462). ChE activity measurements used (in 2 ml) 2 μmoles of acetylcholine iodide, 0.4 μmoles of Ellmans reagent (DTNB; Ellman et al. 1961. Biochem. Pharmacol. 7:88-95), 200 μmoles of phosphate buffer pH 7.4,

and about 200 µg of homogenate protein. The absorbance was read at 412 nm every 60 seconds for 5 minutes. Alkaline phosphatase measurements used (in 1 ml) 5.5 µmoles of p-nitrophenyl phosphate disodium salt, 50 µmoles of glycine buffer pH 10.5, 0.1 µmoles of MgCl₂, and about 200 µg of homogenate protein. The incubation was carried out for 30 min at 37°C, after which p-nitrophenol was estimated at 410 nm (Linhard and Walter. 1962. Methoden der Enzymatischen Analyse. Weinheim, pp 779-785). Acid phosphatase measurements were the same except for the use of 25 µmoles of citrate buffer pH 4.8 and about 50 µg of homogenate protein. Homogenate protein determinations used the Kjeldahl method. Statistical analysis was performed by Student's t-test.

- (9) REPORTED RESULTS: The activities of ChE and acid and alkaline phosphate after the single administration of trichlorfon and dichlorvos are summarized in Table 1. The most rapid changes occurred with ChE, which was inhibited 85% within 60 minutes and 15 minutes with trichlorfon and dichlorvos, respectively. Activities then steadily recovered to control levels by 48-72 hours. Alkaline phosphatase increased at 15-30 minutes, then at 24 hours following trichlorfon administration. At the other times, only an insignificant increase was noted. Following dichlorvos administration, activity fluctuated during the first 5 hours, increased after 24-48 hours, then recovered to the control level

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Page 4 of 6

by 72 hours. Acid phosphatase fluctuated, but showed a decrease at 1, 12, and 24 hours after trichlorfon administration. After dichlorvos administration, activity increased significantly at 5 and 15 minutes and at 48 and 72 hours after treatment.

Enzyme Activities Following Dichlorvos Administration

Time	Enzyme Activity (nmoles/h/mg protein) ¹					
	Alkaline Phosphatase		Acid Phosphatase		Cholinesterase	
	Trichlorfon (n) ²	Dichlorvos (n)	Trichlorfon (n)	Dichlorvos (n)	Trichlorfon (n)	Dichlorvos (n)
Control	454±33 (6)	463±43 (5)	1602±52 (6)	1343±62 (6)	47±2 (6)	47±3 (6)
1 min	500±10 (6)	472±20 (5)	1361±51 (6)	1852±197 (6)	49±2 (6)	49±3 (6)
5 "	440±15 (6)	473±37 (5)	1803±262 (5)	1645±86 (6)	26±3 (6)	25±3 (6)
15 "	639±32 (11)	513±14 (10)	1747±99 (11)	1812±87 (12)	11±2 (6)	8±1 (6)
30 "	581±57 (6)	475±33 (6)	1471±38 (6)	1261±29 (6)	10±1 (6)	14±1 (6)
60 "	471±28 (6)	553±32 (6)	1355±38 (5)	1333±78 (5)	7±0 (6)	18±2 (6)
2 h	421±7 (6)	475±80 (6)	1825±189 (6)	1534±67 (6)	15±1 (6)	19±2 (6)
5 "	436±8 (6)	423±19 (5)	1520±57 (6)	1532±34 (6)	19±1 (6)	25±7 (6)
8 "	522±32 (6)	482±28 (6)	1699±186 (6)	1467±32 (6)	31±3 (6)	26±1 (6)
12 "	582±61 (6)	550±34 (6)	1472±29 (6)	1571±46 (6)	33±2 (6)	30±5 (6)
24 "	609±39 (6)	632±19 (6)	1432±51 (6)	1524±75 (6)	35±4 (6)	33±5 (6)
48 "	514±12 (6)	613±37 (6)	1701±34 (6)	1867±72 (6)	45±4 (6)	44±5 (6)
72 "	-	438±38 (6)	-	1660±113 (6)	-	53±3 (6)

¹Mean±S.E.²Number of experiments

- (10) DISCUSSION: This study demonstrates a precipitous decrease (85%) in brain ChE activity immediately after the administration of trichlorfon and dichlorvos. Activity then steadily recovered. Acid and alkaline phosphatase activities fluctuated. However, these fluctuations are of questionable significance since the difference between the control activities of acid phosphatase for the trichlorfon and dichlorvos series was as large as the fluctuations seen within the treated groups.
- (11) TECHNICAL REVIEW TIME: 5.0 hours