Bull. Environ. Contam. Toxicol. (1990) 45:189–192

Environmental Contamination and Toxicology

Occupational Exposure to DDT among Mosquito Control Sprayers

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DDT, a broad action insecticide whose use is restricted or banned in most industrialised countries is still often used for vector control in many tropical and developing countries. Despite the fact that DDT is accummulative and persistant in the ecosystem (its resistant to enzymatic breakdown by soil microorganisms), use of such substitutes as malathion or propoxur is not popular because these increase costs by 3.4 to 8.5 fold, (WHO, 1979 and 1989). As such DDT is economically attractive to poorer countries.

With an LD_{50} of 0.4g/Kg, almost all poisoning of human subjects by DDT are accidential or suicidal. As far as can be ascertained no systemic poisoning has resulted from occupational exposure to DDT, (Violante and Coltelli, 1986). Due to the large particle size, the amount of DDT inhaled by workers is far less than the amount reaching exposed portions of skin. As such occupational exposure is mainly dermal or tropical. Occupational exposure to DDT studies have been done before, e.g. (Brown and Chow, 1975; Saxena et al ,1987; Nhachi and Loewenson 1989). The present study is an analysis of some characteristics,(i.e. age, body size, relationship between plasma vitamin A and DDE levels, and smoking habits), of occupational exposure to DDT among spraymen in a Zimbabwe population.

METHOD AND MATERIALS

A total of 68 seasonal DDT spraymen were screened for DDT exposure during the spraying period September to December 1988. 10 mls of venous blood was obtained from each worker and the serum was utilised for the analysis of vitamin A (an indice of DDT exposure) using the cnromatographic method of Thunberg et al., 1980: and plasma DDE (DDT methabolite) by the method of Thompson et al., 1969. Workers knowledge of possible health hazards of DDT and assessment of level of provision of protective clothing were evaluated by way of a field questionnaire.

RESULTS AND DISCUSSION

The average weight of the workers was 65.7 kilograms, with a

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standard deviation, (SD) of 6.5 and an average height of 170.8 cm (SD 10.7), the men were of medium body size. Body size is important, in relation to exposure to DDT because of the tendency of DDT to accumulate in human fat, (Reid and McKinley, 1961). The average age of the workers was 28.8 ± 7.9. The majority of the workers 57% were between the age range of 21 and 30 with only one worker over the age of 50 (56 years), see table 1.

Table 1. Age distribution of spraymen

Age range (years)	Number	% Total
11 - 20	7	10
21 - 30	39	57
31 - 40	16	24
41 - 50	5	7
51 - 60	1	2
Total	68	100

Age limit was 19 to 56 yrs

Table 2. Plasma DDE concentration ranges among the spraymen in relationship to vitamin A levels

DDE concentration range (ug/100ml)	Mean Vitamin A Concentration (ng/L)	Number of Men
0.00 - 1.00	1.55 ± 0.92	37
1.01 - 5.00	1.79 ± 1.52	25
5.01 -10.00	1.91 ± 0.35	3
10.01 -15.00	1.44	1

N/B Control (from non DDT spraymen
Vitamin A ranges are 0.2 - 0.9 mg/L

data was obtained from non- DDT sprayer males of comparable age group, and nutritional status using anthropometric calculations.

Table 2 shows a positive ascending relationship between the magnitudes of plasma DDE and vitamin A concentration. A positive correlation between vitamin A and the degree of DDT exposure has been noted before (Phillips, 1963; Keil and Sandifer, 1972; Nhachi and Loewenson, 1989). The authors suggest that the vitamin A

Table 3. Relationship between vitamin A levels, DDE levels and smoking habits

Smoking habits	Number of spraymen and % Total N = 68	Number with vitamin A levels above control range	Number with detectable DDE Levels
S	27 (40%)	20 (74%)* N = 27	3 (11%) N = 27
NS	41 (60%)	24 (59%) N = 41	3(7%) N = 41

S = Smoker
NS = Non smoker
* indicates significance ($p \leqslant 0.05$ compared to corresponding non smokers.

Table 4. Spraymen's knowledge of required protective clothing (A) and health hazards (B) of DDT spraying.

	Number (A)	(B)	% Total (A)	(B)
None	22	40	32	59
Partial	46	28	68	41
Complete	0	0	0	0

level of 1.44 mg/l at DDE concentration range of 10.01 to 15ug/100ml is most likely a statistical distortion.

The relationship between levels of vitamin A and DDE to the spraymen's smoking habits is as shown in table 3. 74% and 11% of the smokers showed high levels of plasma vitamin A and DDE respectively. This seem to suggest an increased risk of exposure with smoking habits. Perhaps some of the spraymen smoke during work periods and are therefore more prone to exposure through inhalation.

Table 4 shows that majority of spraymen, 68% had partial knowledge of the kind of protective clothing that is required for spraying DDT while 59% had no knowledge of the probable health effects of DDT. Whether this discrepancy in knowledge of required protective clothing and health effects of DDT has any effect on risk of exposure is uncertain since this was not tested in the study.

This study has reaffirmed our earlier suggestion that plasma vitamin A levels, can be used as an indice of DDT exposure. The majority of the spraymen (81%) were within the relatively healthy working age range of 21 to 40 years. Lastly, smoking (perhaps at work) seem to increase risk of occupational exposure to DDT.

Acknowledgments. Our gratitude goes to the DDT spraymen and the Provincial Medical Director (PMD) Mashonaland West Province, for their co-operation, to the Swedish Agency for Research and Cooperation with Developing Countries (SAREC) for funding the study and to Mrs Madyambudzi for typing the manuscript.

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Received October 4, 1989; accepted March 2, 1990.