

# The Effect of Liver Damage on the Storage of P,P'-DDT in the Rat

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The metabolism and storage of p,p'-DDT has been studied extensively in the rat (1-4). Some of the factors affecting metabolism and storage which have been investigated are: starvation (5), thyroidectomy (6), adrenalectomy (7), and environmental and dietary stress (8).

Reports on pesticide residues in human tissues have shown that levels of organochlorine pesticides were often higher in patients with abnormal livers (9,10). It was of interest therefore to study the effect of experimental liver damage on the storage of orally administered p,p'-DDT in the rat.

## Experimental

Twenty nine male Wistar rats were divided into five groups and treated as described in TABLE I.

TABLE I

Dosing regimen for studing the effect of liver damage on storage of orally administered p,p'-DDT in the rat.

| Group <sup>a</sup> | 1                | 2                             | 3      | 4                | 5                |
|--------------------|------------------|-------------------------------|--------|------------------|------------------|
| Day 1              | oil <sup>b</sup> | CCl <sub>4</sub> <sup>c</sup> | oil    | oil              | CCl <sub>4</sub> |
| Day 2              | DDT <sup>d</sup> | DDT                           | DDT    | DDT              | DDT              |
| Day 5              | Killed           | Killed                        | oil    | CCl <sub>4</sub> | CCl <sub>4</sub> |
| Day 9              | -                | -                             | Killed | Killed           | Killed           |

a Groups 1 and 2 each contained 7 rats.  
Groups 3, 4 and 5 each contained 5 rats.

b Corn oil, 2 ml per kg, administered orally.

c A 1 + 1 CCl<sub>4</sub>: corn oil solution, 2 ml per kg administered orally.

d A 5 mg per ml corn oil solution of p,p'-DDT, administered orally at 25 mg per kg. The purity of the p,p'-DDT was stated to be greater than 99%.

The rats were housed in an air conditioned room, one group to a cage, and supplied with food and water ad libitum. The rats were killed by decapitation. Blood was collected and the brain, omental fat, liver and testes were removed, weighed and frozen pending analyses.

Tissue Analyses: The serum was analyzed for *p,p'*-DDT, *p,p'*-DDD and *p,p'*-DDE according to Dale *et al* (11). The other tissues were extracted with hexane, cleaned-up and chromatographed as described previously (12). The results were analyzed statistically using the Student Fischer "t" test.

### Results and Discussion

The results of the residue analyses are presented in TABLE II.

TABLE II

Effect of liver damage, induced by carbon tetrachloride, on the total residue of *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD, expressed as total DDT, in tissues of rats orally dosed with 25 mg *p,p'*-DDT per kg body weight.

Residue (ppm total DDT, wet tissue)

| <u>Group</u> | <u>Serum</u>                            | <u>Liver</u>  | <u>Adipose</u>   | <u>Brain</u>  | <u>Testes</u> |
|--------------|---|---------------|------------------|---------------|---------------|
| 1            | 0.19 <sup>a</sup><br>±0.06 <sup>b</sup> | 4.79<br>±1.25 | 92.37<br>±20.99  | 0.27<br>±0.05 | 0.56<br>±0.15 |
| 2            | 0.43<br>±0.10                           | 4.96<br>±0.47 | 121.42<br>±35.57 | 0.78<br>±0.20 | 1.16<br>10.31 |
| 3            | 0.02<br>±0.00                           | 2.02<br>±0.30 | 62.25<br>±8.67   |               |               |
| 4            | 0.12<br>±0.02                           | 8.32<br>±2.71 | 163.96<br>±28.74 |               |               |
| 5            | 0.07<br>±0.02                           | 7.86<br>±2.34 | 131.98<br>±14.88 |               |               |

a Mean

b Standard error of the mean

Student Fisher "t" test.

1. Group 1 serum and brain are significantly different from group 2 at the 5% level.
2. Group 3 serum, liver and fat are significantly different from group 4 at the 5% level.
3. Group 3 serum, liver and fat are significantly different from group 5 at the 5% level.

The levels of p,p'-DDT, p,p'-DDD and p,p'-DDE were significantly greater in the sera and brains of the rats treated with carbon tetrachloride (Group 1 vs 2). This observation is of practical importance since the clinical symptoms of acute DDT poisoning can be correlated with the concentration of DDT in the brain (13).

Although, the residue levels present in the liver and fat on day 5 were not affected significantly by the carbon tetrachloride treatment (Group 1 vs 2), they were significantly higher on day 9 (Group 3 vs 4 and 3 vs 5). There were no differences in residue levels regardless whether the carbon tetrachloride was administered before or after the p,p'-DDT (Group 4 vs 5). In similar studies Laug and Kunze (14) noted 10-100 times the concentration of methoxychlor in the fat and livers of carbon tetrachloride-treated rats compared to controls. Pretreatment with carbon tetrachloride is also known to increase tissue storage PCB's in the rat (12).

The higher residues of DDT present in the carbon tetrachloride-treated rats may explain the higher than normal residues of DDT that have been observed in humans with damaged livers.

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