STORAGE OF ORGANOCHLORINE INSETICIDES IN HEPATOSPLENIC SCHISTOSOMIASIS

M. Wassermann *, A. Prata **, L. Tomatis ***, Dora Wassermann *, I. Ivriani *, Vanete Oliveira **.

This paper reports on the findings of a survey on OCI storage in people in Bahia, Brasil. In this survey 11 samples of adipose tissue were taken from people who underwent splenectomy for hepato splenic schistosomiasis. In these patients, total DDT averaged 10.66 ppm as compared to 4,83 ppm of total DDT found in presumably healthy people. The difference was statistically significant. It is considered that the increased DDT storage in patients with hepatosplenic schistosomiass may be the result of a reduced metabolzation of p,p'-DDT and reduced excretion of its metabolites. Another possibility is the increased exposure to organochlorine nsectcdes by hepatosplenc patients who frequently come from irrigation zones, where these compounds are more used in intensive cultivation.

During the past decade the storage of organochlorine insecticides (OCI) in the adipose tissue has been recognized as a ubiquitous phenomenon. (6)

The amount of OCI stored in the adipose tissue of an individual is determined by the exposure intensity to these compounds and the body's effectiveness in detoxifying them. It has been shown that individual factors like age, sex, race and physiological states influence the OCI storage process.

Concomitant exposure to other xenobiotios (drugs, other pesticides, etc.) quantitatively affect the amount of liver enzymes available for the metabolization of OCI and may thus interfere with the process of their metabolization.

Early studies on the influence of pathological states of the body on OCI storage were unable to show any evidence for such an affect (4, 3). Later reports have, however, demonstrated increased OCI storage in cases of hypertension and malignant disease (1, 2, 5)

This paper reports on a survey of OCI storage in a group of hospital patients in Bahia, Brasil who underwent surgery in 1969 — 70. By chance, a large number of these underwent splenectomy for hepatosplenic schistosomiasis and provided the opportunity to investigate the influence of this disease on the storage of OCI in adipose tissue.

MATERIAL AND METHOD

The cases comprised three groups:

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* Department of Occupational Health, The Hebrew University-Hadassah, Medical School, Jerusalem, Israel.
** Clinic for Tropical and Infectious Diseases, University of Bahia, Bahia, Brasil.
*** International Agency for Research on Cancer, WHO. Lyon, France.

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Group 1 — (12) cases) — Surgery for hernia and laparotomy.

Group 2 — (8 cases) — Surgery for tumoral and inflammatory diseases.

Group 3 — (11 cases) — Splenectomy for hepato-splenic schistosomiasis.

The 31 patients were sampled during laparotomy. A fat tissue biopsy was preserved in formalin 10%; 0.5 g. adipose tissue was extracted 3 times with a total of 20 cc petrol ether. The extract was cleaned on an Ottawa sand — florisil column and reduced to 0.5 ml. Suitable amounts of this extract were injected into a gas chromatograph equipped with an electron capture detector and a strip chart recorder. The graph obtained was compared with the graph of a mixture of known concentration of OCI and some of their metabolites. The levels of organochlorine insecticides given in this paper refer to the concentration in the adipose tissue.

RESULTS AND COMMENTS

Table 1 giving the OCI findings shows that the p,p'-DDT level in the control group (group 1) is low when compared with Group 2 and Group 3. The p,p'-DDE mean value is similar for the first two groups and relatively high in Group 3 (the hepato — splenic schistosomiasis group).

The control (1) and the the miscellaneous group (2) show relatively low mean values of total DDT. The splenectomy group (3) shows higher values of total DDT, which proved statistically different from those of the control group. ($p < 0.05$).

The beta isomer of benzene hexachloride, dieldrin and heptachlor epoxide have been detected in all the samples analyzed in this investigation. Their mean level was below 1 ppm and did not reveal any significant variation with regard to the groups investigated.

It appears from the comparison of these data that metabolization of p,p'-DDT as removal of its metabolites was slowed down in the splenectomy group resulting increased storage of both p,p'-DDT and its main metabolite p,p'-DDE. The explanation for this fact may lie in the subtle biochemical lesions of the liver in schistosomiasis affecting enzyme homeostasis (producing a decrease of p,p'-DDT and p,p'-DDE metabolization). The excretion of DDT metabolites at the kidney level may also be involved.

Another possibility is that cases of hepato splenic schistosomiasis frequently come from irrigation zones. Therefore they are possibly more exposed to organochlorine insecticides since these are more used in crop control in such areas of intensive cultivation.

TABLE 1 — Concentration of DDT and its metabolites in adipose tissue

Compound	Group 1	Group 2	Group 3
p,p'-DDT	0.61 + 0.42	2.07 + 2.52	2.50 + 3.23
p,p'-DDD	0.095 + 0.126	0.020 + 0.028	0.082 + 0.144
p,p'-DDE	3.67 + 2.66	3.19 + 2.87	7.15 + 5.32
p,p' DDT - DDD	0.030 + 0.047	0.024 + 0.036	0.108 + 0.291
p,p'-DDE	0.003 + 0.001	0.005 + 0.003	0.005 + 0.013
total p,p'-DDT	4.80 + 3.28	5.64 + 5.65	10.55 + 8.34
total p,p'-DDT	0.095 + 0.126	0.030 + 0.036	0.114 + 0.290
total DDT	4.83 + 3.47	5.67 + 5.69	10.66 + 8.46
Rate of metabolization	89	64	76

Statistical evaluation of total DDT values: Gr. 1 $\vee$ 3 $P < 0.05$, Gr. 2 $\vee$ 3 $p < 0.10$

RESUMO

Determinou-se a quantidade de compostos organo-clorados no tecido adiposo de onze esquistossomóticos hepatosplenicos e de 20 outros doentes. O material foi colhido durante ato cirúrgico. A quantidade de DDT foi, em média, 10,66ppm nos hepatosplenicos, 4,83ppm em pacientes submetidos a herniorrafia ou laparotomia e 5,67ppm em doentes operados por apresentar doenças neoplasicas ou inflamatórias. A diferença tem significação estatística. O aumento de depósito de DDT nos hepatosplenicos poderia ser devido a redução na metabolização de p,p'-DDT e na excreção de seus metabolitos ou a maior exposição a inseticidas organo-clorados. Presume-se que os hepatosplenicos venham habitualmente de zonas de irrigação, onde o consumo de inseticidas na agricultura seja maior.

REFERENCES

1. CASARETT, L. J., FRYER, G. C., YAUGER, W. L., & KLEMMER, H. W. Organochlorine pesticide residues in human tissues. Hawaii Arch. Environmental Health. *17:* 306, 1968.

2. DEICHMAN, WM. B. & RADOMSKI J. L. Retention of pesticides in human adipose tissue. Preliminary Report. In-Indust. Med. and Surgery. *37:* 218-219, 1968.

3. HOFFMAN, W.S., ADLER, H. FISHBEIN, W.J. & BAUER F. C. Relation of pesticide concentrations in fat to pathological changes in tissues. Arch. Environ. Hlth. (Chicago), *15:* 58, 1967.

4. MAIER-BODE, H. DDT in Korperfett des Menschen. Med. esp. *1:* 146-152, 1960.

5. RADOMSKI, J. L. DEICHMANN, W. D.; CLIZER, E. E. & REY, A. Pesticide concentrations in the liver, brain and adipose tissue of terminal hospital patients. Fd. Cosmet. Toxico. *6:* 209--220, 1968.

6. WASSERMANN, M., & DORA WASSERMANN. Recognition of a new group of toxic substances as current constituent in the human body: the organochlorine insecticides. Proc. V Int. Congress on Occupational Health, Vienna *6:* 954--956, 1966.