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Residues of Organochlorine Pesticides in Some Nigerian Food Materials

Samuel S. Atuma

Department of Chemistry, University of Benin, Benin City, Nigeria

Since the early 1960s industrialized countries have reported on the environmental fate of organochlorine pesticides (Jensen et al 1972; Lunde and Ofstad 1976; Linder and Dahlgren 1979; Tanabe et al 1983). In Nigeria and in many other developing countries little work has been done to establish the extent and magnitude of pesticide pollution.

In most African countries and other developing countries, pesticides are used as a quick and ready answer to the numerous crop pest problems, and for the control of endemic and epidemic diseases like malaria, typhoid fever, filariasis and trypanosomiasis. It can be argued that the threat of hunger and disease seems more real and immediate than that posed by the hazards of pesticide residues in the environment. Unfortunately this optimism can precipitate indiscriminate and injudicious importation and application of pesticides in pest and vector control which may result in food contamination by residues and eventual pesticide toxicity to man and animal.

In pursuit of our baseline study on the prevalence of organochlorine residues in the tropical environment, investigation has been carried out on residues in vegetables and the muscles and livers of some animals used for human consumption in Nigeria. Previous papers have reported residue levels in blood and urine of the general population in Nigeria (Atuma 1984; Atuma and Okor 1984) and freshwater fishes (Atuma and Eigbe 1984). It is hoped that these data will establish a baseline for determining changes in residue levels of organochlorine insecticides in future years.

MATERIALS AND METHODS

Meat and vegetable samples were collected at random

from various market places in Southern Nigeria between 1982 and 1983. They were analysed for residues of organochlorine insecticides.

All the samples were extracted fresh. The extraction of the samples and subsequent purification of the extracts were in accordance with the methods presented previously (Jensen et al 1972). These consisted of homogenization, extraction of homogenates and clean-up by concentrated sulphuric acid and/or ethanolic potassium hydroxide.

Analyses were carried out by gas liquid chromatography on a model 3700 Varian Aerograph Gas Chromatograph equipped with a ^{63}Ni electron capture detector and a 25m x 0.25mm i.d. SE 54 glass capillary column. Column temperature: $150^{o}C$ initially, then programmed at 6^{o}/minute up to $260^{o}C$; injector temperature: $225^{o}C$; detector temperature: $320^{o}C$; and nitrogen flow rate: 4ml/minute.

All other conditions were as reported previously (Atuma and Eigbe 1984). The determinations were done at the Institute of Environmental Chemical Analysis, Wallenberg Laboratory, University of Stockholm, Sweden.

RESULTS AND DISCUSSION

The residue levels of the organochlorine insecticides investigated are given in Table 1, expressed in mg/Kg of the extractable lipid. The HCH isomers are the most prevalent residues and were found in virtually all the samples analysed. DDT and its metabolites were also prevalent among the vegetable samples but not so conspicuously represented in the other samples,that is, the meat samples did not have discernable DDT residue. Although the HCH isomers were found in relatively low concentrations, the high percentage of ß-HCH in comparison to other isomers indicates its stability. There were isolated cases of considerable residual amounts of aldrin, dieldrin and endrin in the vegetable samples. Trace amounts of o,p-DDT, oxychlordane and nanochlor were also detected but not quantified. HCB featured in a number of samples, notably the vegetable samples. It would appear that all kinds of organochlorine insecticides are imported into this country. The presence of residues in cow meat and liver may not be surprising because of the feeding habits of cows. The fields on which they graze may be contaminated by insecticide sprays. It would have been expected that antelope samples should not contain any residues because of the "pristine" nature of their habitat but the le-

Table 1. Residue levels in vegetables and meats (mg/kg of extractable lipid)

Samples	HCB	alpha HCH	beta HCH	gamma HCH	p,p' DDE	p,p' DDD	p,p' DDT
Spinach	0.22	0.11	0.62	0.50	0.19	0.45	0.69
Cabbage	-	0.31	0.91	1.68	0.49	-	0.15
Tomato	-	0.13	0.72	0.64	-	-	-
Carrot	2.18	0.06	0.84	0.78	0.57	-	0.53
Onion	1.11	0.14	0.35	0.16	2.81	0.30	1.26
Cucumber	0.38	0.12	0.31	0.24	0.06	0.31	0.68
Lettuce	0.08	0.18	0.51	0.88	0.46	-	0.51
Antelope (liver)	-	0.03	0.05	0.05	0.06	-	0.04
Antelope (meat)	0.01	0.03	0.04	0.04	-	-	-
Cow(liver)	0.06	0.02	0.02	0.03	0.05	0.01	0.02
Cow(meat)	-	-	0.01	-	0.03	0.04	0.01
Goat (liver)	-	0.02	0.02	0.04	-	-	0.04
Goat (meat)	-	0.03	0.02	0.05	-	-	-
Chicken (liver)	-	0.03	0.06	0.05	-	-	-
Chicken (meat)	-	0.01	0.03	0.03	-	-	-

vels found in them, though very low, confirm the numerous reports that organochlorine compounds have become universal pollutants and they are detected in virtually all animal tissues, even those sampled in remote parts of the world far from areas of large scale application.

Concern over the potential adverse effects of these chemicals in man has led to extensive routine monitoring programs of the environment in the developed countries. In like manner there is need for proper screening of the tropical environment of the developing world for these residues if irreparable damage to wildlife, man and his environment is to be avoided in these areas.

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