

Residue Levels of Organochlorine Insecticides in Lamb and Beef from Baghdad

Muthanna Al-Omar, Mabrouk Al-Bassomy, Nehla Al-Ogaily, and
Dia Al-Din Shebl

Biological Research Centre, Jadiriah, P.O. Box 2371 Baghdad, Iraq

The use of organochlorine insecticides for more than two decades in malaria control program in Iraq and neighbouring countries may result in the distribution of their persistent residues in the environment and biota in this region. The use of these compounds has been banned in Iraq officially in 1976, yet their residues are expected to remain for several years. A monitoring program was proposed in 1981 by the Biological Research Centre in Baghdad to determine the residue levels of these compounds in the environment, food and human body.

The present work is concerned with fresh lamb and beef from Baghdad district, intended for human consumption, since meat represent an important source for the daily intake of chlorinated hydrocarbons.

MATERIALS AND METHODS

Two lots of lamb and beef were collected randoumly from Baghdad markets in 1983, each lot consisted of 20 samples weighing about 250 gm of fresh carcass meat. Fatty portions were chopped, melted at 60–80°C and filtered through glass wool before extraction (Telling 1977).

All solvents were glass redistilled and tested by electron capture gas chromatography according to AOAC method(AOAC 1975). Florisil (60–100 mesh PR grade, Merck, Darmstadt, W.Germany) activated and stored according to AOAC method. Standard pesticide mixture was obtained from Supelco, S.A. Switzerland.

Subsamples of 5 gm fat were weighed out, extracted and cleaned up according to AOAC-Mills procedure(AOAC 1975), aliquots of 5 micro-liter extract were injected using Hamilton microsyringe(Hamilton Bonaduz AG) into a Pye-Unicam model GCV gas chromatograph(Pye-Unicam, Cambridge, England) equipped with a ^{63}Ni electron capture detector and a glass column (1.5M x4mm i.d.) packed with 1.5%OV-17 +1.95% OV-210 on chromosorb W HP.(Supelco S.A.).Operating temperatures were 200,220 and 300°C for column, injector and detector respectively. Mixture of 90+10% argon/methane was used as a carrier gas at a flow rate of 30 ml/min.

Determination of organochlorine residues was made by direct comparison with a standard calibration graph plotted as concentration against peak area given by a Pye-Unicam-Phillips CDP-4 computing integrator coupled to the gas chromatograph. Confirmation of the results was performed by TLC according to AOAC procedure(AOAC 1975)

RESULTS AND DISCUSSION

Residues detected and confirmed were those of lindane, aldrin, dieldrin, heptachlor, heptachlor epoxide, cis- and trans- chlordane and isomers of DDT, DDD, and DDE. Their average values in lamb and beef expressed in ppm(fat basis) are listed in TABLE-1.

These compounds are not used in the time being in livestock production or protection in Iraq, but they are probably comprised in animal's diet as residues from the environment. Very little information is available concerning environmental pollution in this region with chlorinated hydrocarbon insecticides. However, overall residue levels appear to be generally low, particularly those of lindane, aldrin, dieldrin and DDT.

Lindane does not represent an environmental hazard at the levels determined in this work which are far below the maximum residue limit (MRL)(2mg/Kg on fat basis) as given by the Joint FAO/WHO Meetings for Pesticide Residues(JMPR)(FAO/WHO 1983). No sample has been found to exceed the MRL (Table 1).

Both aldrin and dieldrin were officially banned in Iraq in 1976, the latter is a metabolite of the former, the sum of them is expressed as dieldrin in TABLE-1. Dieldrin appeared less frequently than aldrin, this may be due to the low recovery of dieldrin in our laboratory (55%) using Mills procedure. Johnson (1962) used 15% diethyl ether in petroleum ether as eluent for dieldrin, while Zweig and Sherma (1977) suggested using 20% of this eluent mixture to improve elution process of this compound, high dieldrin recovery is still questionable. On the other hand reduction of dieldrin level could also be attributed to the presence of DDT analogues and metabolites in animal tissues (Street 1964). All average values of the sum of aldrin and dieldrin were within the MRL of the JMPR (Table 1) with the exception of few samples of beef.

Chlordane insecticide has been widely used in Iraq for soil treatment or to protect wooden structure against termites. However it was not possible to evaluate chlordane residue level since no data is given for carcass fat by the JMPR (FAO/WHO 1983). Heptachlor has never been used in this country, therefore residue detected in this work is mainly due to its presence in chlordane formulation(BCPC 1980). Few samples of each of the two types of meat studied were found to exceed the MRL as the sum of heptachlor and heptachlor epoxide,(Table 1), yet the overall average level remained within the MRL(0.2 mg/Kg on fat basis as ERL).

DDT level in some samples was relatively high but did not reach the MRL(7 mg/Kg on fat basis as ERL)(FAO/WHO 1983) while the average level of the total DDT compounds, as mentioned in TABLE-1 for lamb and beef are considerably low.

Table 1. Percentage of occurrence, range and average levels in ppm(fat basis) of organochlorine insecticides detected in lamb and beef from Baghdad region-1983.

	Lamb			Beef				
	Percentage occurrence	Range (ppm)	Average level (ppm)	No. of samples exceed. MRL	Percentage occurrence	Range (ppm)	Average level (ppm)	No. of samples exceed. MRL
Lindane	100	0.004-1.611	0.225	0	80	0.005-0.830	0.116	0
Dieldrin ¹	95	0.024-0.151	0.067	0	100	0.002-0.344	0.101	3
Heptachlor ²	75	0.019-0.203	0.067	2	100	0.006-0.369	0.124	4
Chlordane ³	80	0.032-0.606	0.126	ND	65	0.007-0.267	0.068	ND
Total DDT	90	0.042-3.226	1.048	0	100	0.059-2.503	0.875	0

1. Sum of aldrin and dieldrin; 2. Sum of heptachlor and heptachlor epoxide; 3. Sum of cis- and trans- chlordane ND. not determined.

In 1981 Al-Omar et al(1985) detected DDT in dairy products from the same region at a level of 0.81 mg/Kg (fat basis). This may suggest a relatively low level of this insecticide in spite of its long use in Iraq.

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