

PESTICIDE RESIDUES IN FOOD STUFFS

1- In imported food

BY

A.A. Abdel-Gawaad and A. Shams El Dine

Faculty of Agriculture, Moshtohor, Zagazig University, Kalubia, Egypt.

ABSTRACT

J. Egypt. Soc. Toxicol. 5: 49-52 (1990)

The level of pesticide residues in various imported diet samples, randomly collected from different parts of Egypt, was determined. Most of the tested products contained organochlorine insecticides i.e. endrin, dieldrin, DDT, lindane and traces of some unidentified compounds. The levels of these residues in some products were higher than the FAO/WHO maximum residue limits. Particularly, the level was higher in the case of endrin and DDT in cereal grains, endrin in dried milk and Σ DDT in frozen liver. However, pesticide residues in most of the analyzed samples were within acceptable level.

INTRODUCTION

Insecticides used all over the world for many years in plant protection and public health programs, have caused serious environmental problems. These priority pollutants concentrated along food chains, reach the human body in the daily diet, and are deposited and accumulated in adipose tissues [Morita *et al.*, 1975 & Mori *et al.*, 1983].

Many publications revealed the existence of pesticide residues, mainly organochlorine compounds, in various food items. Abdel-Gawaad, 1985 and Abdel-Gawaad & Shams El Dine, (1989), detected 23 pesticide residues and their degradation products in many foodstuffs samples. Different pesticides were identified in infant diet, meat, fish, poultry and grain cereal products. The most frequently detected residues were those of DDT, dieldrin, lindane, BHC and heptachlor epoxide [Gartrell *et al.*, 1985 and Sullivan, 1980]. Egypt import more than 50% of its food stuffs consumption. Food is the main source of the pesticides taken in the human body, the remainder resulting from other sources such as air, water and dust. within this context and in order to protect health, there will be a need to control the concentrations of pesticide residues in all imported food stuff.

The object of this study was to examine the residual level of pesticides in the main imported food groups, compared to the international guideline values.

Materials and Methods

Samples:

117 imported food stuff samples were collected from different parts of Egypt. These samples were canned meat, tomato paste, dried milk, wheat, wheat flour, corn grain, frozen meat, fish, liver and poultry. Samples were stored at -18°C until analysis.

Methods of analysis:

A- Extraction:

Representative samples were chopped and mixed prior to subsampling. From which 50g was macerated with 100ml of propylene carbonate. The macerate was vacuum-filtered through glass wool and anhydrous sodium sulfate.

B- clean-up:

Column chromatography was used to separate the organochlorine and organophosphorus compounds. Glass column of 25mm inner diameter and 400mm height filled with 50g deactivated Florisil was prepared. A layer of sodium sulfate, about 2cm in height was added. The column was prewashed with 50ml petroleum ether. The samples was eluted with successive and separate 200ml portions of 70% diethyl ether in petroleum ether followed by 25% diethyl ether in petroleum ether. 200ml fraction was collected in a Kuderna-Danish flask for concentration to dryness. Then, the concentrates were dissolved in 1ml final volume for gas chromatography analysis.

C- Gas chromatography analysis:

A gas chromatograph equiped with electron capture detector was used under the following conditions:

Column:

glass column, 183cm long packed with OV 17.

Carrier gas:

pure nitrogen at flow rate of 30ml/min.

Operating temperature:

injector 250°C, column 230°C, detector 250°C.

RESULTS AND DISCUSSION

Table 1 shows that about 89% of the tested samples were contaminated with residues of pp'DDT, pp'DDE, op'DDE.

48% of imported food samples contained lindane residues. Also, 46%, 42% and 13% of the analysed samples were polluted with endrin, dieldrin and heptachlor residues respectively. The significance of these contaminations differ from pesticide to another, as well as from product to another.

Organochlorine pesticide residues in food of animal origin:

Measurements of pesticide contaminants in these imported frozen meat, liver, poultry and fish indicated that E.D.T was higher than the acceptable international values. The residues of other organochlorine pesticides, as endrin, dieldrin, heptachlor and lindane were generally within acceptable limits. Heptachlor was not detected at all in meat and liver samples, while it was present in very low quantities in poultry and fish samples.

Organochlorine pesticide residues in processed imported food:

Samples of dried milk, canned meat and tomato past contained traces of organochlorine pesticides. All values were lower than the WHO/FAO acceptable limits. The major contaminants were DDT and its isomers, followed by lindane. The lowest concentration was found in case of heptachlor.

Table 1: Insecticide residues in 10 imported food groups

FOOD GROUP	NO. OF SAMPLES ANALYSED	ENDRIN		DIELDRIN		pp'DDT		pp'DDE		op'DDE		HEPTACHLOR		LINDANE		NO. OF UNKNOWN PRODUCTS
		M	ND	M	ND	M	ND	M	ND	M	ND	M	ND	M	ND	
DRIED MILK	10	0.002	4	0.008	5	0.416	1	0.020	1	0.002	1	0.001	9	0.042	7	13
FROZEN MEAT	10	0.106	7	0.068	6	0.297	-	0.352	-	0.050	-	-	10	0.239	6	9
FROZEN LIVER	10	0.608	6	0.065	6	0.248	-	0.404	-	0.050	-	-	10	0.025	5	17
FROZEN POULTRY	15	0.012	9	0.616	10	0.924	-	0.082	-	0.082	-	0.006	13	0.614	3	9
FROZEN FISH	10	0.020	6	0.103	3	0.208	-	0.516	-	0.022	-	0.008	7	0.018	2	6
CANNED MEAT	10	0.102	4	0.111	8	0.318	-	0.242	-	0.120	-	0.002	6	0.180	6	15
WHEAT	15	0.086	11	0.020	10	0.104	3	0.082	3	0.040	3	0.001	15	0.202	5	2
CORN	15	0.142	8	0.038	9	0.118	2	0.120	2	0.085	2	0.006	15	0.364	7	9
WHEAT FLOUR	10	0.002	7	0.002	8	0.106	7	0.001	6	0.002	7	-	10	0.001	8	9
TOMATO PAST	12	0.146	2	0.128	3	0.289	-	0.208	-	0.096	-	0.008	7	0.605	3	15
TOTAL	117		64		68		13		12		13		102		52	

M: Mean value of pesticide concentration in the tested samples in mg/kg.

ND: Number of samples in which no pesticides were detected.

The value of endrin and lindane residues in dried milk was not in fact higher than the acceptable level. Dried milk contained about 30% fat, while codex value in figure 2 is based on raw milk which contain 10 times less % of fat.

Table 2: List of codex maximum residue limits in food stuff in mg/kg

FOOD GROUP	ENDRIN	DIELDRIN	DDT	HEPTACHLOR	LINDANE
RAW MILK	0.0008	0.006	0.5	0.006	0.01
MEAT	0.1	0.2	5	0.2	2
FISH	-	-	-	-	-
POULTRY	1	-	-	0.2	0.7
CEREAL GRAIN	0.02	0.02	0.1	0.02	0.5
TOMATO PAST	-	-	-	0.2	-

Organochlorine pesticide residues in corn, wheat and wheat flour:

Wheat and corn contained residues of DDT and endrin more than the acceptable residue limit.

Dieldrin residue in corn was also higher than the codex value, wheat flour contained much lower residues of pesticides comparing to grains. This must be due to the elimination of the fatty portion, while all this organochlorine compounds are lipophilic. These results show that, even many years after stopping to use these organochlorine pesticides, traces are still detectable in human diet. Most of the tested imported food stuff contained chlorinated hydrocarbon pesticide residues.

An overview of the results of the analysis of imported food in Egypt indicated that residues of DDT are still, in many cases, higher than the acceptable limits. This persistent insecticide is stable under most environmental conditions. Daily intake from food has been recorded as high as 0.286mg/man, most of which originated from foods of animal origin. DDT is almost totally absorbed in small doses. The main effect of DDT is on the nervous system, both central and peripheral. The liver is the only other organ significantly affected. In long-term feeding tests in mice and rats, liver changes progressed from hypertrophy margination and lipospheres to the formation of nodules of affected cells. In addition to the identified pesticide residues, a number of unidentified compounds were detected. It is recognized that the pesticides for which a maximum residue limits have been recommended by the international organizations do not represent all of those which can be identified in food stuff.

Egypt import every year enormous quantities of food stuffs, for example about 2 million tons of cereals, 265000 tons of meat and 29000 tons of dried milk. Therefore, in order to protect human health, there will be a need to control the concentration of pesticides residues in such imported products. The impact of pesticides pollution can be seen in many developing countries, in which many diseases assumed to be due to environmental pollution and food contamination prevail.

In conclusion, setting up local Egyptian norms for concentration of pesticides in food become a must. This must be based on international residue limits, available health related data, our local circumstances and our consuming habits.

REFERENCES

- Abdel-Gawaad, A. A. (1985):* Pesticide residues levels in soils and crops. 2nd Inter. Cong. Soil. Poll. Part II, 87-108.
- Abdel-Gawaad, A.A. and Shams El-Dine A. (1989):* Insecticide residues in total diet samples. J. Egypt. Soc. Toxicol. Vol. IV. (In press).
- Gartrell, M.J.; Crown, U.C.; Podrebarac, D.S. and Grunderson, E.L. (1985):* Pesticides, selected elements, and other chemicals in infant and toddler total diet samples, October 1978, September 1979. J. Assoc. off ANAL Chem 68:(5) 842-857.
- Morita M.; Mimura, S. and Yagyū G. Ohi (1975):* A systematic determination of chlorinated benzenes in human adipose tissue Environ. Pollut. 9: 175-179.
- Mori, Y.; Masanori, K.; Ercuko, O. and Toshihiro, O. (1983):* Levels of PCBs and organochlorine pesticides in human adipose tissue collected in Ehime prefecture. Bull. Environm. Contam. Toxicol 30: 74-79.
- Sullivan, J.H. (1980):* Pesticide Residues in Imported Spices. A survey for chlorinated hydrocarbons. J. Agric. Food. Chim. 28: 1031-1034.