EGYPTIAN INFANT AVERAGE DAILY INTAKE OF SOME PESTICIDE RESIDUES DURING HIS FIRST YEAR OF LIFE

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ABSTRACT

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The average daily intake of some pesticide residues for the Egyptian infant in his first year was estimated based on the infant's average daily intake of different foods as assessed in a previous survey, the detected residue levels of some organochlorine insecticides in these groups of foods, and the average weight for Egyptian infants during the first year of life. Results indicated that the estimated daily intake (EDI) for Dieldrin and Endrin were 0.002187 mg/kg B.W. and 0.000626 mg/kg B.W. which exceeded the acceptable daily intake (ADI) established by the FAO/WHO.

The EDI of ΣDDT and Lindane residues were below the ADI being 0.02 and 0.008 mg/kg B.W. respectively as established by the FAO/WHO.

Furthermore, the main bulk of pesticide residues intake is obtained from the different types of milk.

INTRODUCTION

It has been long recognised that pesticides are of immense benefit to mankind, helping to increase crop production and controlling vector-borne diseases as the benefits of pesticides can be medical, social and economic. However in recent years, there has been a tendency in public domain to focus on the negative aspects of these achievements.

In general all human operations carry some degree of risk and this is as true for pesticide usage as with any other human activity.

In Egypt, 690,000 metric tons of about 182 pesticides were used during the period from 1952 up to 1990 (Abdel Gawaad, 1985 and CAPMAS, 1991).

Persistence of such pesticides within the environment leads to significant contamination of foods and mainly milk and its products which are the main source of food of pregnant and lactating women (Abdel Gawaad, 1989 and Al-Omar, et al., 1986).

Many authors detected significant concentrations of pesticide residues especially organochlorine insecticides in human milk in different

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countries (Newton and Green , 1972; Savage, 1976; Sakurai et al., 1979; FAO/WHO, 1981; Ezz, et al., 1991, Redondo, et al., 1991).

Cripps, et al., 1980 and Peters, et al., 1982; reported that newborn infants died as a result of HCB intoxication from mother's milk. HCB concentrations were recorded as high as 700 ppb. Also, Umana and Constenla, 1984 indicated chronic contamination with DDT and DDE in nursing mothers milk at amount of 2.6 ppm.

Lembryck, et al., 1986 detected DDT and its analogues in women venous blood samples in concentration 0.05 mg/L and HCH was found in 40% of samples in concentration 0.002 mg/L.

In Iraq, Al-Omar, et al., 1989 indicated the presence of Aldrin, Dieldrin, Chlordane, Heptachlor, Heptachlor-epoxide and DDT and its isomers and metabolites in human milk samples. Concentrations of heptachlor, chlordane and dieldrin were 0.001, 0.371 and 0.017 respectively.

El-Sheikh, et al., 1989 detected in breast milk in Egypt variable amounts of pp`-DDT, $p,p$`-DDD, o,p`-DDT; Aldrin, $p,p$`-DDE and o,p-DDE. They concluded that chlorinated hydrocarbons constitute a major hazard leading to pollution of breast milk.

In Kenya, organochlorine insecticide residues in mothers milk were detected in the following order of frequency P,P`-DDT (100%); $P,P$`-DDE (100%); HCB (60%); aldrin (35%); Lindane 30%; HCH (27%) and Dieldrin (20%). The level of Σ DDT obtained (18.7 mg/kg) were higher than corresponding level from industrialized countries and the estimated daily intake of kenyan infant exceeded the ADI set by WHO/FAO (Kanja, et al., 1989).

In Cow and buffalo milk, the residues of organochlorine and organophosphorous insecticides were detected, in Kenya (Maitho, 1989) and in India (Dhaliwal, 1990; Singh and Singh, 1990 and Verma, 1990).

In Hong-Kong, Ip (1990) detected high level of total BHC and total DDT in the samples analyzed. The estimated daily ingestion of total BHC and total DDT were 10 and 9 folds that found in the US respectively.

Oliveri,et al., 1989 detected organochlorine insecticides in sheep milk in Marsala region, the total DDT and Lindane concentrations were above the maximum permissible levels. The ground water may be the source of insecticides.

In fish, the organoclorine insecticides were detected by Falandysz (1985) in Southern Baltic; Eisenberg and Topping (1986) in Maryland (USA); Vuorinen, et al. (1989) in Baltic Salmen and by Zimakov et al., 1991 in RUSS. in fresh and canned fish at levels of mg/kg 0.069 HCH; 0.106 DDT; 0.117 DDD and 0.058 DDE.

Kumano, et al., 1988 studied the pesticide residues in meat. The residues levels of *P,P'*- DDE were 0.14 in beef ; 0.02 in pork and 0.03 ppm in mutton.

Mugabi, et al., 1989 in Kenya detected high residues in eggs. They detected 10 pesticides, the concentrations of total DDT at range 0.01 - 10.25 mg/kg eggs and 0.01 - 4.9 mg/kg for Dieldrin.

In Morocco, Kessabi, et al., 1990 demonstrated that Lindane and HCB were the most prominent residues in eggs, poultry liver, bovine liver and kidney. Albert, 1990 in Mexico and Yess, 1990 in U.S.A detected organochlorine and organophosphorus residues in foods produced and imported. The samples contained residues exceeding the EPA tolerance; 1% of the analyzed samples.

Morchio and De Andries, 1989 detected organochlorine pesticide residues in vegetable oils. Peanut and sesame oil were the most contaminated of the other vegetable oils. The most common residues were HCH, α-δ - BHC, *P,P'*-DDE and DDT. The total organochorine residues in olive oil reached to 39.2 ppb.

Ungaro, et al., 1980 detected residues of DDT, Endrin, Aldrin, Dieldrin and Dimethoate at unallowed levels in 10% of samples of vegetables and fruits collected in Sao Paulo, Brazil.

Yoshida, et al., 1986 studied the daily intake of pesticides in infants (0 - 3 years old). They found that HCH was detected in 100% of samples collected. DDT, Dieldrin were found in 92 and 89% of samples respectively. The average daily intake of HCH, DDT, Dieldrin were 1.00, 0.45 and 0.17 µg/kg respectively.

Information on the dietary intake of contaminants is of special health concern for comparison with acceptable or tolerable intake levels.

In this study, we aim to monitor the average pesticide residue level of some persistent pesticides in different foods consumed by the Egyptian infant in his first year of life. Furthermore, the average daily intake of such pesticides for such infants in the first year of life will be estimated on the basis of the Egyptian average daily intake of basic types of foods for such age group as estimated by previous documented surveys, the average residue levels detected, and the average weight of Egyptian infants, in relation to the established international Maximum Permissible Daily Intake.

MATERIALS AND METHODS

Samples:

Fifty samples of a total diet were collected according to the sampling procedure of FAO/WHO standards programme (GIFAP, 1982).

Samples comprised milk (human, Powder and fresh), eggs, meats, beans, rice, cereals, vegetables (cooked, raw and potatoes), fruits and water, samples were kept at -18°C until analysis.

Extraction and Clean-up:

1) Eggs, meats, beans, rice, cereals, vegetables and fruits:

Extraction and clean-up of the representative samples according to the universal method (Schnorbus and Philips, 1967).

2) Milk:

A modified AOAC method reported by Zazuki et al., 1979 was conducted.

3) Water:

500 ml sample was extracted with 25 ml of benzene in a single extraction by shaking it in a separatory funnel for 2 min. The separated extract was concentrated to 1 ml by blowing a stream of air over the benzene in a fume cupbord.

Gas chromatography determinations:

Analysis were performed on a gas liquid chromatograph equipped with an electron capture detector under the following conditions:

Column: glass column, 183 cm long paked with OV 17.

Carrier gas: Pure nitrogen at a flow rate of 30 ml/min.

Oparating temperature: Injector: 250°C, Column: 230°C, Detector: 250°C.

RESULTS AND DISCUSSION

Data were collected from a survey conducted by the Egyptian Nutrition Institute of the Ministry of Public Health regarding the average amount and types of foods given to Egyptian infants in the first year of their life as well as their average weight during such period (Fahmy, 1984 and Galal, 1989).

The average diet/infant/day is tabulated in table I. The Egyptian infant is basically milk fed. The milk constitutes over 76% of his daily diet (excluding water) and 31% when water is included. Furthermore, the breast milk: formula milk : fresh milk ratio is 4.44 : 1 : 1.93 respectively.

The average weight of the Egyptian infant during his first year of life is 6.000 kg.

Table 1: Average composition of the total daily diet of an Egyptian infant in the first year of life in grams

Type of food	Milk			Eggs and meats	Beans	Rice	Cereals	Vegetables			Fruits	Water
	Human	powder	Fresh					Cooked	Raw	Potatoes		
Average daily consumption	287.775	64.775	125.000	22.200	4.000	9.725	14.350	24.925	24.950	25.800	28.300	900.000

The analyses of the different foods showed that ΣDDT (*P,P`*-DDT, *O,P*-DDT, *P,P`*-DDE, *O.P*–DDE and *P,P`*-DDD); Dieldrin, Endrin and Lindane were the major pesticide residues detected in different food stuffs intakes of Egyptian infants. The detected quantities of these residues and average of estimated daily intake were included in table II.

Results showed that milk in different forms contained large quantities of the detectable residues followed by vegetables, cereals and eggs and meats respectively. ΣDDT were the larger residues in all food samples. These results agree with those reported by Abdel-Gawaad, and Shams El-Din, 1989; El-Dib and Badawy, 1985; Aly and Badawy, 1984 and El-Sheikh, et al. 1989.

From table I and II we can calculate the average daily intake of chlorinated insecticides from mixed diet fed to Egyptian infants during their firest year of life (Table III).

The comparison of the estimated daily intake (EDI) of pesticides residues in Egypt with the ADI established by FAO/WHO shows that Egyptian infants intake high level of residues than the accepted by FAO/WHO. For Dieldrin the estimated daily intake was 21.87 folds of the ADI, while for Endrin it was 3.13. The estimated daily intake of ΣDDT and Lindane were less than the ADI.

An overview of the results indicates the extensive problems made by the parents to their children, as the infants are more susceptible to the hazards of environmental pollutants than adults.

Considering to the results of Cripps, et al., 1980 and Peters, et al., 1982 which reported that new born infants died as a result of HCB intoxication from mother's milk and the results of El-Sheikh, et al., 1980 which concluded that chlorinated hydrocarbons constitute a major hazard leading

Table II: Pesticide Residues In Daily Diet of Egyptian Infant

Detected Residues / Type of Food		DDT	Dieldrin	Endrin	Lindane
Human milk:	ADR	0,056900	0,015130	0,011700	0,000860
	TEDI	0,016374	0,004345	0,003367	0,000247
Powder milk:	ADR	0,438000	0,008000	0,002000	0,042000
	TEDI	0,003546	0,000065	0,000016	0,000340
Fresh Milk:	ADR	0,316500	0,069500	0,002800	0,118000
	TEDI	0,039563	0,008688	0,000350	0,014750
Eggs & Meats:	ADR	0,000616	0,000011	0,000119	0,000092
	TEDI	0,000014	>0,000001	0,000003	0,000002
Beans:	ADR	N.D.	N.D	N.D	0,000001
	TEDI	—	—	—	>0,000001*
Rice:	ADR	0,000001	N.D	N.D	0,000019
	TEDI	>0,000001	—	—	>0,000001*
Cereals:	ADR	1.000200	0,000130	0,000200	0,001100
	TEDI	0,000017	0,000002	0,000003	0,000016
Cooked Vegetables:	ADR	0,000700	0,000120	0,000010	0,000210
	TEDI	0,000017	0,000003	>0,000001*	0,000005
Raw Vegetables:	ADR	0,000700	0,000120	0,000010	0,000210
	TEDI	0,000017	0,000003	>0,000001*	0,000005
Potatoes:	ADR	0,001100	0,000134	0,000210	0,000300
	TEDI	0,000028	0,000003	0,000005	0,000008
Fruits:	ADR	0,000050	0,000002	0,000003	0,000002
	TEDI	0.000001	>0,000001*	>0,000001*	>0,000001*
Water:	ADR	0,000043	0,000003	0,000010	0,000004
	TEDI	0,000039	0,000003	0.000009	0,000004

N.D. = Not detected.

* = Residue less than 0,000001, neglected in ADI calculation

ADR = Average Detected Residues (mg/kg).

TEDI = Total Estimated Daily Intake (mg).

Table III: Total and Average daily intake of pesticide residues:

Detected Pesticide	Average estimated residues in total diet (mg)	Estimated daily intake (EDI) mg/kg	ADI* mg/kg	EDI/ADI Ratio
DDT	0.059616	0.002936	0.020000	0.4968
Dieldrin	0.013121	0.002187	0.000100	21.8700
Endrin	0.003753	0.000626	0.000200	3.1300
Lindane	0.015397	0.00266	0.008000	0.3206

to pollution of breast milk and finally our data we can conclude that there is a need want to set up maximum residue levels (MRLs) in foods. This must be based on international MRL's, available health related data, our local circumstances and consumption habits.

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