

MONITORING OF ORGANOCHLORINE PESTICIDE RESIDUES IN BOTH FRESH AND PACKED MILK

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ABSTRACT

A total of 525 samples were collected from greater Cairo (Cairo, Giza and Qualobia Governorates) during the autumn season as it follows the summer period during which the maximum use of pesticides takes place for controlling cotton pests.

Samples were extracted and cleaned up and pesticide residues were detected by using GLC apparatus equipped with an electron capture detector.

Results indicated that aldrin residues were detected in 28.57% and 86.67% of packed and bulk milk respectively. Residue levels ranged from 0 to 0.1024 and from 0 to 0.1049 mg/L in both packed and bulk milk.

Dieldrin residues were detected only in packed milk. The residue levels ranged from 0 to 0.0484 mg/L. Only 14.29% of packed milk samples contained dieldrin.

Chlordane was detected in 85.71% and 93.33% of both packed and bulk milk samples respectively. The residue levels ranged from 0 to 1.271 mg/L, respectively.

Only 14.29% and 26.67% of the packed and bulk milk samples respectively contained Σ DDT. Residue levels ranged from 0 to 11.9950 and 0 to 3.786 mg/L, were detected respectively.

Packed milk contained endrin in 14.29% of samples at levels ranged from 0.0 to 0.3644 mg/L, while no residues were detected in bulk milk samples.

Hepachlor residues levels ranged from 0.0308 to 2.1312 and from 0 to 1.0143 mg/L in both packed and bulk milk samples. Hundred percent of packed milk and 73.33% of bulk milk were contaminated with hepachlor residues.

Lindane residues were detected in 85.77% and 80% of both packed and bulk milk respectively. The residues varied between 0.0 to 0.0098 mg/L and 0.0 to 0.0111 mg/L, respectively.

INTRODUCTION

Now measurable amounts of pesticide residues find their way to pollute our food. Organochlorine pesticides were detected in human milk samples in Finland (Russett, - Rauhamaan 1988), in Italy (Dommarco et al., 1987), in Norway (Skare et al., 1988), in Sweden (Noren and Sjoval, 1987), in Kenya (Kanya et al., 1992), in Zimbabwe (Chikani et al., 1991), in Germany (Ehrenstorfer et al., 1991); in Yugoslavia (Krauthacker, 1991); in Egypt (Doughim et al., 1990 and 1991) and in Canada (Frank et al., 1985).

Data also indicate that cow milk is also polluted by organochlorine pesticide residues as reported before by Jain et al., 1991, Ijesschen and Bluhgen, 1985 and Bluhgen et al., 1984 (in Germany); Saleh, 1991 (in USA); Lucisano et al., 1982 (in Italy); Juszkiewicz, 1982 and Juszkiewicz and Niewiadowska, 1984 (in Poland). El-Airy, 1981 reported that all samples collected from Qualobia province in Egypt contained lindane and endrin with a range between 0.01 to 0.03 ppm. Abdel-Gawad and Shams El Din, 1989 and 1990 detected endrin, dieldrin, lindane and DDT in fresh and powder milk.

MATERIALS AND METHODS

Milk Samples:

Total of 135 packed ultra - highvated milk samples and

390 samples of bulk milk comprising of fresh cow and buffalo milk were collected from three governorates (Cairo, Giza and Qualobia). The samples were kept in deep-freezer under -18°C until analysis.

Standard used:

The following primary standards were obtained from the repository of the U.S. Environment Protection Agency at Research Triangle Park, N.C. These standards included: Aldrin, Dieldrin, BHC, Chlordane, DDE, DDD, DDA, DDT, Lindrin, Hepachlor and Lindane.

The working standard solutions of three concentrations were prepared daily 1, 2 and 4 nanogram per microliter with pesticide quality hexane solvent.

Extraction and Clean up:

The same method used before by Abdel-Fatah et al., 1992 was used for extraction and clean up.

GC Detection:

Hewlett Packard, Model HP 5890 A programmable gas chromatography equipped with electron capture detector was used under the operating conditions, initial temperature 150°C, temperature rate 5°C per minute; final oven

temperature 240°C; oven maximum temperature 250°C; injector temperature 220°C; Detector temperature 300°C; flow rate of carrier gas 40 ml N₂/min.

RESULTS

Results in Table 1 show that aldrin residues were detected in 28.57% of packed milk samples. The residue level ranged from 0.0 to 0.1024 mg/L. The mean value was 0.0309 mg/L with a standard deviation of 0.0383. Aldrin

Heptachlor residues were detected in 100% of packed milk samples but in 73.33% of the bulk milk samples. The mean of detected residues were 0.565 ± 0.7288 and 0.4276 ± 0.3553 ppm in packed and bulk milk samples respectively. The maximum range of residues was 2.1312 ppm in packed milk while in bulk milk samples was 1.0143 ppm.

Table 1 : Percentage of incidence of different chlorinated hydrocarbon insecticides in packed and bulk milk samples within specific concentration ranges

Detected Residues	Kind of Milk sample	Residues range in ppm	Percent incidence	Average Mean ± S.D in ppm
Aldrin	Packed	0.0 - 0.1024	28.57	0.0309 ± 0.0383
Chlordane	Packed	0.0 - 0.1155	85.71	0.0259 ± 0.0403
Chlordane	bulk	0.0 - 1.2710	93.33	0.0214 ± 0.0347
Dieldrin	Packed	0.0 - 0.0484	14.29	0.0069 ± 0.0183
Dieldrin	bulk	N.D.*	00.00	N.D.*
DDT	Packed	0.0 - 11.9950	14.29	1.7071 ± 4.5167
DDT	bulk	0.0 - 3.786	26.67	0.3337 ± 0.9706
Endrin	Packed	0.0 - 0.3644	14.29	0.0521 ± 0.1377
Endrin	bulk	N.D.*	00.00	N.D.*
Heptachlor	Packed	0.0308 - 2.1312	100.00	0.5650 ± 0.7288
Heptachlor	bulk	0.0 - 1.0143	23.33	0.4276 ± 0.3553
Lindane	Packed	0.0 - 0.0098	85.70	0.003 ± 0.0035
Lindane	bulk	0.0 - 0.0111	80.00	0.0051 ± 0.0039

residues were also detected in 86.67% of bulk milk samples. The residue levels ranged from 0.0 to 0.1049 mg/L. The mean value was 0.0247 mg/L with a standard deviation of 0.0293.

Chlordane residues were detected in 85.71% of packed milk samples. The residue levels ranged from 0.0 to 0.1155 with a mean value 0.0259 ± 0.0403 mg/L. While in bulk milk the incidence of chlordane was in 93.33% at range from 0.0 to 1.2710 mg/L. The mean value was 0.0214 ± with standard deviation of 0.0347.

Dieldrin residues in packed milk ranged from 0.0 to 0.0484 with mean equal 0.0069 ± 0.0183. The percent of incidence of dieldrin was 14.29% in packed samples and 0.0% in bulk samples.

Sum DDT residues included DDE, DDD, DDT and DDA. The DDA was the only analogue detected in the packed milk while in the bulk milk DDE was detected. The DDT residues were detected in 14.29% of packed samples and in 26.67% of bulk milk. The residue levels ranged from 0.0 to 11.9950 ppm at mean of 1.7071 ± 4.5167 ppm in packed milk samples. The residue levels of DDT were less in bulk milk than in packed milk samples.

Endrin residues were detected in 14.29% of packed samples but not detected in bulk samples. The average

Table 2: Average detected residues (ADR) of insecticide in tested milk samples.

Insecticide	ADR ppm	MRL* mg/L	ADR/MRL ratio
Aldrin	0.0267	0.0060	4.45
Chlordane	0.0228	0.0020	11.40
Dieldrin	0.0022	0.0060	0.37
DDT	0.7707	0.0500	15.41
Endrin	0.0166	0.0008	20.75
Heptachlor	0.4713	0.0060	78.55
Lindane	0.0046	0.0100	0.46

*MRL = maximum residue level

Lindane or γ -BHC, residues were detected in 85.70% and 80.00% of the analysed packed and bulk milk samples respectively. The mean of residues was 0.0033 ppm in packed samples and 0.0051 in bulk milk samples.

- Results in table 2, showed the average detected residues (ADR) as calculated from all samples and the maximum residue level (MRL).
- These results indicated that aldrin, chlordane, DDT and heptachlor residues were exceeded the MRL. The highest ratio was shown in heptachlor it was 78.55 folds more than the MRL.
- ### Discussion
- For economic reasons, organochlorine pesticides, have been, and are still used extensively in Egypt (Abdel Gawad 1985 and CAPMAS 1992). The presence of high levels of organochlorine pesticide residues in milk in Egypt was reported by El Ailly 1981, Abdel Gawad and Shams El Dine 1989, Abdel Gawad 1985, and Ezz, et al., 1991a,b). High levels of different chlorinated hydrocarbon pesticides were also reported in milk in USA Rogan et al., (1986) and Bakken and Seip (1976); in Japan by Inoue et al., (1979); in Spain by Lora et al., (1979); in Israel by Weisenberg et al., (1980); in Costarica by Umata and Constanza (1984) and in Egypt by Ezz et al., (1991 a).
- The global perspective of organochlorine pesticide residues in dairy milk as compiled by the GEMS/food programme reveals from the data submitted by reporting countries, that, in general, milk contains the highest residue levels compared to any other food group. However, these residues are generally below MRL's with a few exceptions and are slowly declining in most developed countries such as USA, Canada and Netherlands as well as some developing countries. There is no evidence of change in these levels with time as the general trend is maintained except for Germany, Japan and some developing countries, where the level is increasing at a high rate. (GEMS, 1991).
- The organochlorine pesticides detected in this study are in accordance with previous studies conducted in Egypt in general for most pesticides. However, residues for some pesticides, that were not used extensively in Egypt at any time, were detected at an exceptionally high level in both packed and bulk milk samples. This could only be explained by the contamination of animal feeds and concentrates used. As the relation between levels of chlorinated hydrocarbons in feed and that in cows milk is linear. However at lower levels in feed the level in milk could be as much as double or more that in feed (Witt et al., 1966 and Mansour 1976). These feeds and concentrates are being imported from countries that used or may be are still using these pesticides.
- Another possible explanation for the aforementioned contamination, especially when the high levels are mainly in packed milks is that such residues are present in the imported powder milk being added and recombined with fresh milk in some packed milk factories and possibly in some of the bulk milk as well.
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