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Organochlorine Compounds in Human Milk, Porto Alegre, Brazil

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Levels of chlorinated insecticides in human milk have been studied in many areas of the world. In Brazil there are a few surveys (Matuo 1978; Lara et al 1982; Matuo 1987; Sant'ana 1988; Carvalho et al 1989), but none of them were carried out in Rio Grande do Sul, an important agricultural region of Brazil where pesticides are extensively used.

This paper describes a survey of organochlorine pesticides residues and PCB's in human milk of residents in Porto Alegre , capital of the state of Rio Grande do Sul, during 1987/88.

MATERIALS AND METHODS

Samples of human milk were collected from 30 volunteers, arbitrarily selected among lactating women who have lived in the urban area of Porto Alegre for at least 5 years. Milk samples were collected mannually or by vacuum pump , into pesticide-free glass bottles, under supervision. After collection, samples were immediately frozen until analysis. Donors were asked to answer to a questionnaire with information concerning some factors relevant to pesticide residue accumulation such as age and number of breast-fed children.

Lipids were extracted from milk according to methods described by the Association of Official Analytical Chemists (1975) , replacing petroleum ether by n-hexane. Fat was extracted for organochlorine insecticide residues analysis according to a modified Clayes & Inman (1974) method, as following :

An amount of 0,125g of fat was applied to an alumina column, deactivated with 5% water after heating for 4 hours at 800°C, eluted with 0,4% (v/v) diethylether in n-hexane. The fraction was carefully evaporated to almost dryness in an all glass rotatory evaporator (30°C). The fraction was adjusted to 2ml with n-hexane. Dilutions were made when necessary. All GLC analyses were conducted on a VARIAN Model 2440 gas chromatograph equipped with a ^{63}Ni eletron-capture detector. Two glass columns were used for identification and quantification of each residue reported (1,5% OV 17 + 1,95% OV 210 on

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chromosorb W 100-120 mesh and 5% QF1 on chromosorb Q 80-100 mesh). Carrier gas was nitrogen at a flow rate of 35 mL/min to the first column and 27 mL/min to the second.
Recoveries of pesticides and PCB's were checked periodically by fortification of cow's milk. The average of obtained was 110% with coefficient of variation = 18.4%.
The limits of detection to this method are : HCB (0.01ppm), α-HCH (0.01ppm), β-HCH (0.01ppm), γ-HCH (0.01ppm), aldrin (0.01ppm), oxychlordane (0.01ppm), heptachlor epoxi (0.01ppm), transnonachlor (0.01ppm), pp'DDE (0.01ppm), dieldrin (0.01ppm), endrin (0.02ppm), op'+ pp'DDD (0.02ppm), op'DDT (0.02ppm), pp'DDT (0.02ppm), mirex (0.03ppm), pp'metoxychlor (0.10ppm), aroclor 1248 (0.80ppm), aroclor 1254 (0.80ppm), aroclor 1260 (1.60ppm).
All reagents and chemicals used were of pesticide or analytical grade and checked for any pesticide contamination. Standards were obtained from U.S. Environmental Protection Agency.

RESULTS AND DISCUSSION

The average fat content in the milk samples was 2,4%(g/100mL), individual values ranging from 0,3 to 5,3%(g/100mL).
The number of chlorinated hydrocarbon compounds detected per sample ranged from two to eleven, among those 12 compounds which were identified in table 1.
All samples analysed showed measureable quantities of pp'DDE and β-HCH. The average, median, range and frequency of various organochlorine pesticides residues are shown in table 1. The major constituent of " Σ DDT" was pp'DDE (95%).
Seventy-three per cent of the samples exceeded the pratical limit (1,25 ug/g, lipid basis) recommended by WHO (1986) for DDT (alone or combined with DDD and DDE) in cow's milk. . The limit of nonintentional residue of ΣHCH in cow's milk fat fixed by Brazilian legislation is 0,10 ug/g. Only two out of the 30 human milk samples showed values below this limit.
In 1973 the use of DDT was prohibited in the USA. In 1985 the use of DDT and other organochlorine compounds was closely restricted by Brazilian laws. One may suppose that in various regions of the country this restrictions has not been obeyed.
Table 2 shows that Σ DDT follows a decreasing trend according to the number of breast-fed children.
The eight samples with the highest Σ DDT concentrations were obtained from women lactating for the first time. These findings agree with those reported by Noren (1983) for Swedish women.The following pesticides and PCB's were also investigated in human milk but their concentrations were below the Detection Limit : Aldrin , Oxychlordane Transnonachlor , pp'metoxychlor, Aroclor 1248 , Aroclor 1254 , Aroclor 1260 .

Table 1. Organochlorine pesticides concentrations in human milk samples.(in μg/g of fat). (Concentrations of ΣHCH and ΣDDT are also expressed as μg/mL of whole milk).

Pesticides	Mean	Median	Range	n/N(a)
α - HCH	0.04	0.03	<0.01 - 0.14	24/30
β - HCH	0.90	0.28	0.02 - 5.66	25/25
γ - HCH	0.02	0.01	<0.01 - 0.21	15/30
Σ HCH (b)	0.96	0.34	0.07 - 5.84	- - -
Σ HCH(whole milk)	0.0178	0.0056	0.0001 - 0.0798	- - -
pp'DDE	2.53	1.74	0.29 -11.1	30/30
pp'DDD	0.03	<0.02	<0.02 - 0.20	24/29
pp'DDT	0.12	0.07	<0.02 - 0.80	22/30
op'DDT	0.02	<0.02	<0.02 - 0.04	3/30
Σ DDT (c)	2.98	2.25	0.32 -12.4	- - -
Σ DDT (whole milk)	0.0869	0.0571	0.0010 - 0.03480	- - -
HEPT.EPOXI	0.02	<0.01	<0.01 - 0.07	5/30
DIELDRIN	0.07	0.02	<0.01 - 0.83	25/30
ENDRIN	- - -	<0.02	<0.02 - 0.02	1/30
HCB	0.02	<0.01	<0.01 - 0.15	19/30
MIREX	0.03	<0.03	<0.03 - 0.06	5/30

(a) n = number of positive samples / N = number of samples analysed
(b) ΣHCH = α + β + γ
(c) ΣDDT = 1,115 DDE + 1,11 DDD + DDT [according Albert et al (1981)]

Table 2 . Concentration of Σ DDT according number of breast-fed children. (μg/g).

Number of children	N	Mean	S.D.	Median
1	16	3.98	0.83	2.55
2	10	2.16	0.52	2.06
3,4 and 5	3	1.08	0.32	0.81

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