DDT and DDE Content of Human Milk in Arizona[1,2]

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There has been concern over the levels of dichlorodiphenyltrichloroethane (DDT) in human milk for many years. LAUG et al. (1951) found DDT in milk of 94% of the women examined in Washington D. C. None of these women had previous known exposure to DDT. There was an average concentration of 0.13 ppm of DDT in the whole product.

Several years later WEST (1964) reported DDT levels in human milk ranging from 0.0 to 0.12 ppm and dichlorodiphenyldichloroethylene (DDE), a metabolite of DDT, levels ranging from 0.0 to 0.25 ppm. Other workers (CURLEY and KIMBROUGH, 1969; QUINBY et al., 1965) in the United States have reported averages in the 0.06 to 0.08 ppm range. Reports from Hungary (DENES, 1964), England (EGAN et al., 1965), and Russia (GRACHEVA, 1970) have shown levels of DDT in human milk comparable to those reported in this country. DAMASKIN (1965), a Russian, found levels ranging from 1.22 to 4.88 ppm in the fat of human milk. These values are comparable to the other reports which were given on a whole product basis.

Materials and Methods

Six lactating women served as donors for this study. Milk samples were collected by each donor in a sterilized bottle or plastic bag and stored at ca -10°C until picked up. Each donor recorded the day, time and breast from which the sample was removed. It was requested that approximately 30 ml samples be collected once daily for the first two weeks post partum, once weekly from two weeks to two months and bimonthly from then until six months or termination of lactation. All samples were transported to the laboratory in a frozen state and kept at ca -25°C until analyzed.

Electron capture gas chromatography was used for analysis (WITT et al., 1966). DDE, p,p'-DDT and o,p-DDT were identified by comparison of retention times of authentic compounds. A sample size of 175 ml of milk was initially collected and a 10 ml subsample was used for analysis. There was a final extract volume of 5 ml, with injection

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TABLE 1.

Mean levels of pesticides in human milk at different stages of lactation.

Sampling Period (days post Partum)	No. of Samples	ppm p,p'-DDT	o,p-DDT	DDE	Total
0-3	2	0.019 (0.007)[a]	-	0.074 (0.004)	0.093 (0.003)
4-7	3	0.037 (0.005)	0.036 (0.043)	0.246 (0.070)	0.319 (0.085)
8-10	4	0.031 (0.027)	0.005 (0.003)	0.214 (0.144)	0.250 (0.172)
11-14	2	0.017 (0.003)	0.003 (0.0005)	0.110 (0.051)	0.130 (0.054)
15-21	3	0.046 (0.025)	0.007 (0.003)	0.187 (0.081)	0.240 (0.108)
22-30	3	0.210 (0.261)	0.004 (0.0008)	0.182 (0.065)	0.396 (0.317)
31-45	4	0.318 (0.289)	0.007 (0.002)	0.185 (0.074)	0.510 (0.361)
46-60	2	0.383 (0.367)	0.005 (0.005)	0.187 (0.076)	0.575 (0.447)
61-90	4	0.116 (0.133)	0.022 (0.016)	0.314 (0.231)	0.452 (0.246)
91-120	1	0.032	0.005	0.123	0.160
120+	2	0.025 (0.005)	0.005 (0.000)	0.125 (0.031)	0.155 (0.038)
S^2		0.030427	0.000267	0.014707	0.058115
Std. Error		0.03185	0.00298	0.02214	0.04401

[a]Figures in parenthesis under each mean indicate standard deviation from the mean.

volume varying from 3.5 to 6.5 µl. Acceptable variability of replicated samples was less than 5%. The recoveries from dosed samples through the range reported were: 80-85% for DDE, and 95-105% for both o,p-DDT and p,p'-DDT. Means and variance were computed for each data group and standard errors of the means were computed for each characteristic. If mean differences exceeded two standard errors they were judged to be significantly different (SNEDCOR, 1956).

Results and Discussion

The results of the analysis of human milk for chlorinated hydrocarbons are found in Table 1. All milk analyzed contained some chlorinated hydrocarbons. The levels were, for the most part, higher than those previously reported (CURLEY and KIMBROUGH, 1969; DAMASKIN, 1965; DENES, 1964; EGAN et al., 1965; GRACHEVA, 1970; LAUG et al., 1951; QUINBY et al., 1965; WEST, 1964). Whether this is due to the location of the study is not known. It is known that Arizona has had a recent history of relatively high levels of chlorinated hydrocarbons in its commercial milk supply (WITT et al., 1966). There was a higher amount of p,p'-DDT secreted in the milk from 22-60 days post partum than there was before or after this period. However, this increased secretion was not significantly different ($P>0.05$) from the lower figures. There was a much lower amount of o,p-DDT present than there was p,p'-DDT. DDE was found at higher levels in most of the samples than was p,p'-DDT. DDE has been shown to be a normal metabolite of p,p'-DDT and is normally found in higher concentrations in biological materials than the parent compound (WHITING et al., 1968; WITT et al., 1966). The total pesticides in human milk found in this study ranged from just under twice the legal limit for chlorinated hydrocarbons as established for commercial cow milk by the FDA (Code of Federal Regulations, 1971) up to over ten times the legal limit.

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