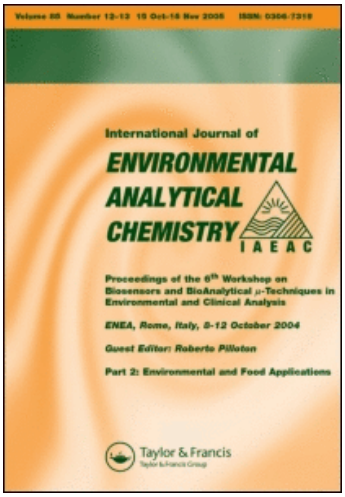

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Aldrin and Dieldrin in Maternal Serum, Cord Serum and Breast Milk in Human Samples from Delhi, India

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ALDRIN AND DIELDRIN IN MATERNAL SERUM, CORD SERUM AND BREAST MILK IN HUMAN SAMPLES FROM DELHI, INDIA

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Aldrin and dieldrin were monitored in samples of maternal serum, cord serum and mother's milk, collected from young mothers three days *post partum*. All mothers were permanent residents of Delhi. For the 25 donors, the average aldrin content was 0.40 ppb in breast milk, 0.17 ppb in maternal serum and 0.05 ppb in cord serum. The average dieldrin content was 0.13, 0.09 and 0.04 ppb in breast milk, maternal serum and cord serum, respectively.

A significant correlation between the levels of aldrin and dieldrin was found in maternal milk and maternal serum, and maternal milk and cord serum. There was no significant correlation between maternal serum and cord serum.

KEY WORDS: Breast milk, maternal serum, cord serum, aldrin, dieldrin, environment, monitoring.

INTRODUCTION

The widespread use of persistent organochlorine pesticides has led to contamination of the environment: their residues have been found at every level of the food chain.[1] Organochlorine pesticides have been detected in human fat, milk and blood.[2,3,4] Today, almost all developed countries have restricted or banned the use of these chemicals; however, in the developing countries, because of the cost-benefit ratio, the organochlorines are still the major pesticides used in agriculture.

The aim of the present study was to assess the aldrin and dieldrin levels in breast milk, maternal serum and cord serum from mothers and their infants as there have been no reports in this area from India.

EXPERIMENTAL

Samples Samples of maternal blood, breast milk and cord blood from 25 mothers (22.2 ± 4.5 years of age) and their new borns from Irwin Hospital, Delhi, constituted the study group. Maternal blood samples were collected from the median cubital

vein of the left arm immediately after delivery and cord blood samples were collected by declamping the placental side of the umbilical cord. Breast milk samples were manually expressed from lactating mother during feeding hours. All milk samples were collected 3 days *post partum*.

Instrumentation Residues of aldrin and dieldrin were determined using a Hewlett Packard model 5890A gas chromatograph equipped with a Ni^{63}-electron capture detector and coupled with an integrator. A megabore capillary column, 0.53 mm i.d. and 10 M long, packed with 3% OV-17 was used. The operating conditions were as follows: the column temperature was initially held at 200°C for 3 min, followed by a rise in temperature at the rate of 10°C/min to a final temperature of 250°C. Detector and injector temperatures were maintained at 300°C. Nitrogen was used as a carrier gas at a flow-rate of 50 ml/min.

Aldrin and dieldrin were identified by their retention times. Quantitative measurements were based on peak areas. The detection limit for aldrin and dieldrin was 0.001 μg. In samples, residues of aldrin and dieldrin were further confirmed by using a Joel model JMS DX-300 GC-MS.

Chemicals Standards of aldrin and dieldrin were obtained from the Environmental Protection Agency (Research Triangle Park, NC, USA). Standard solutions were prepared in hexane. Chemicals used during extraction were pesticide-grade materials.

Procedure The pretreatment method confirms with the specifications of the US Environmental Protection Agency.[5]

Preparation 5–7 ml of blood were collected in 15-ml tubes and stored in a refrigerator for 30 min. The samples were then centrifuged at 2500 rpm for 10 min. 2 ml of the serum obtained were kept in vials at −20°C until extraction. Similarly, 5 ml samples of human milk were collected in 10-ml vials with PTFE screw caps and stored at −20°C until further analysis.

Sample extraction The milk sample was transferred to a round-bottom flask, and then Shell-freezed in liquid nitrogen and lyophilized. The powder obtained was weighed and Soxhlet-extracted with 150 ml *n*-hexane for 8 hours.[6] The extract was concentrated to 2 ml in a flash evaporator and then cleaned over an alumina column with 60 ml *n*-hexane,[7] prior to further analysis. 2 ml of the serum were extracted with 6 ml *n*-hexane in a slow-speed rotating mixer for 2 h; 5 ml of the hexane extract were concentrated to 0.5 ml in a stream of nitrogen.[5] A suitable aliquot of the samples was analysed by GC.

RESULTS AND DISCUSSION

The percentage recoveries of aldrin and dieldrin from spiked breast milk and blood samples are shown in Table 1. A total of 9 samples comprising 3 samples each of

Table 1 Per cent recovery of aldrin and dieldrin from spiked samples.

Sample	*Aldrin*	*Dieldrin*
Breast milk	85	87
Maternal serum	90	91
Cord serum	89	92

breast milk, maternal serum and cord serum were spiked with 0.5 ml of 1 ppm aldrin and dieldrin, respectively. The average recovery was found to be more than 85%. Consequently, the data presented in Table 2 have not been corrected for recovery.

The residues of aldrin and dieldrin present in breast milk, maternal serum and cord serum are summarized in Table 2.

The average levels of aldrin in breast milk, maternal serum and cord serum were found to be 0.40, 0.17 and 0.05 ppb, respectively. The aldrin level was higher in mother's milk than in maternal serum and cord serum. The level of aldrin (0.017 ppm) and dieldrin (0.030 ppm) in human milk were found to be higher in Baghdad.[8] Similarly, an earlier report from India showed 0.035 ppm aldrin in human milk which was much higher than the present survey.[9] A highly significant correlation was observed between the aldrin concentration in breast milk and maternal serum ($r = 0.942$; $P < 0.001$) and between breast milk and cord serum ($r = 0.742$; $P < 0.001$). However, no correlation was observed between maternal serum and cord serum ($r = 0.087$).

Dieldrin was found to be present in smaller amounts than aldrin. The present level of dieldrin in breast milk and blood serum is much lower than that in developed countries.[2,10,11,12,13] Dieldrin has not been used in our country since 1975. Consequently, whatever dieldrin has been detected in the samples may not actually originate from the environment, but may stem from oxidation of aldrin to dieldrin. The accumulation of dieldrin in breast milk and maternal serum showed a positive correlation ($r = 0.780$; $P < 0.001$). A significant correlation was also observed between breast milk and cord serum ($r = 0.592$; $P < 0.01$) and maternal serum and cord serum ($r = 0.759$; $P < 0.001$).

Table 2 Levels of aldrin and dieldrin in breast milk, maternal serum and cord serum in ppb

Sample	*aldrin*		*Dieldrin*	
($n = 25$)	*Mean ± S.E.*	*Range*	*Mean ± S.E.*	*Range*
Breast milk	0.40 ± 0.08	1.0–0.1	0.13 ± 0.03	0.1–0.02
Maternal serum	0.17 ± 0.05	0.4–0.1	0.09 ± 0.03	0.1–0.015
Cord serum	0.05–0.01	0.1–0.01	0.04 ± 0.01	0.09–0.01

SUMMARY

Levels of aldrin and dieldrin were quantitatively determined in samples of maternal serum, cord serum and maternal milk collected from young mothers, from Irwin Hospital in Delhi, India, three days *post partum*. Results show significant uptake of aldrin and dieldrin. The ADI levels for aldrin and dieldrin according to US Food and Drug Administration are 0.0001 ppm; the mean value in the present studies was found to be higher.

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