INFLUENCE OF SHORT-TERM DIETARY MEASURES ON DIOXIN CONCENTRATIONS IN BREAST-MILK.

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INTRODUCTION

Concentrations of dioxins and dibenzofurans (henceforward jointly summarized as dioxins) in human milk are rather high [1]. This is a reflection of exposure of man to these compounds, mainly by animal fats in food [2]. Breast-feeding may expose infants to relatively high doses of dioxins and furans during a short period. In an attempt to reduce the levels of these xenobiotics in human milk, two diets were developed.

Starting-point was the hypothesis that mobilization of fatty acids from adipose tissue would cause release of herein stored dioxins. By favouring the other sources for fatty acids in breast-milk, that are dietary lipids and de novo mammary synthesis, the release of dioxins would be diminished. The subsequently lower circulating levels of dioxins would result in lower dioxin concentrations in the milk.

METHODS

One diet tested was an isocaloric low fat/high carbohydrate/low dioxin diet. The aim was to reduce fat intake till about 15 energy per cent (en%). By offering large amounts of carbohydrates it was tried to stimulate the de novo synthesis of fatty acids by the mammary gland. The other diet tested was an isocaloric high fat/low carbohydrate/low dioxin diet. Fat intake was increased till about 50 en%. By offering large amounts of oils and fats of vegetable origin to the mammary gland, it was tried to increase the excretion of "clean" dietary lipids into the milk. Both diets have in common that the use of animal fats was minimized, with the exception of the relatively uncontaminated pork [3].

Table 1. Dioxin concentrations in breast-milk during the normal diet and during the test-diet (TEQ ng/kg milk fat).

		normal diet		test-diet		
diet	N	mean	SEM	mean	SEM	P*
low fat/high carbohydrate/low dioxin	17	32.8	2.9	33.2	3.9	0.83
high fat/low carbohydrate/low dioxin	19	26.0	2.4	23.3	2.1	0.19

* two-tailed paired Student's t-test

The diets were tested in a group of 36 healthy well-nourished totally breast-feeding women between the ages of 21 and 38 years. After delivery they were ad random assigned to one of the test-diets. In the third week after delivery all women kept a food-record of their normal diet for seven days. On the last day of the week, they sampled their breast-milk with an electrical breast-pump. The breast was emptied as much as possible. For the following five days they used the test-diet. They could make up their own menu from the articles on the list of allowed foodstuffs. During this test-diet they also kept a food-record. On the fifth day they took another breast-milk sample. The method used, and the time of sampling, were similar as during the first time. During both weeks the participants weighed daily to check for weight loss. At the end of the study the food-records were calculated by a dietician.

RESULTS AND DISCUSSION

Dioxin concentrations in breast-milk were not significantly influenced by the test-diets used, as shown in table 1. This is probably due to the relatively small mean dietary changes. Firstly, there was a large inter-individual variation in both the normal dietary habits, and in the magnitude in which the diet changed, when switching from the normal diet to the test-diet. Secondly, there was a large intra-individual variation in the intake of single diet components during one period a diet was used. To avoid this problem, we correlated the magnitude of changes in single dietary components with the magnitude, in which dioxin content of milk fat changed when switching from the normal diet to the test-diet. Only the food-records over the last two days of both periods were used, because the composition of milk fat is a reflection of the diet used two days before [4]. We found a borderline significant inverse correlation between changes in total fat intake and energy intake over the last two days a diet was used, and dioxin concentrations in milk fat.

Table 2.
Correlation between change in single diet components (amount in test-diet minus normal diet) and change in dioxin concentration in milk fat (test-diet minus normal diet).

independent variable*	r	coef	constant	P#
energy intake (kJ/d)	0.32	-0.004	-2.196	0.06
total fat intake (g/d)	0.31	-0.037	-1.910	0.06
total carbohydrate int (g/d)	0.15	0.015	-1.121	0.40
total protein int (g/d)	0.25	-0.069	-1.232	0.15
total alcohol int (g/d)	0.09	-1.049	-1.499	0.61
fat intake (en%)	0.26	-1.228	-1.859	0.12
carbohydrate intake (en%)	0.28	0.128	-1.825	0.10
protein intake (en%)	0.09	-2.052	-0.961	0.62
alcohol intake (en%)	0.07	-0.271	-1.416	0.67

* all independent variables are the differences between the total amount or energy% of these dietary components in the last two days of the test diet and the last two days of the normal diet (after minus before test diet).
\# two-tailed significance

CONCLUSION

The results from this study indicate that it will be difficult to reduce dioxin levels in breast-milk by short-term dietary measures. An extreme hypercaloric high fat/low dioxin diet might be able to reduce the concentrations of these compounds in milk fat, but it will be difficult to maintain this kind of diet for several weeks or months during lactation. The only method to influence dioxin concentrations in breast-milk will be prolonged use (years) of food with a low dioxin content, to prevent dioxins from entering and accumulating in the body.

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