

PCDD/PCDF-Intake from Food in the South-Western Part of Germany

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ABSTRACT

Between 1993 and 1995, 1007 food samples collected in the south-western part of Germany were analysed for PCDD/PCDF contamination. The results show that the actual PCDD/PCDF intake is considerably lower than calculated for Germany between 1986 and 1991 in general. The mean daily intake was calculated as 0.93 pg I-TEQ/kg b.w./day.

1 Introduction

In Germany, about 95 % of the total average PCDD/PCDF intake is estimated to come from food. On the basis of data from 1986 to 1991, the Federal Health Institute (formerly Bundesgesundheitsamt, BGA) calculated the average daily PCDD/PCDF intake from food as 127.3 pg, according to 1.8 pg I-TEQ/kg body weight (b.w.)/day (1). This was nearly double the amount of 1 pg I-TEQ/kg b.w./day which should not be exceeded with respect to the value of precaution (2). Therefore, numerous measures were taken to reduce the exposure of man and the environment to dioxins (3). Recent surveys proved a decrease of the dioxin burden in food and breast milk in the last years (4 - 6).

A duplicate study showed that the mean daily intake from food collected in Germany in 1994 has fallen to 0.91 pg I-TEQ/kg b.w./day for men (range 0.2 - 2.23) and to 0.79 pg I-TEQ/kg b.w./day for women (range 0.13 to 3.04) (7). In another duplicate study, a daily intake in the range of 0.18 to 1.7 pg I-TEQ/kg b.w./day was found. Here, neither the mean intake nor the individual results were mentioned (8).

Having analysed 1007 food samples from 1993 to 1995, we'd like to present the results and compare this new data with the formerly published.

2 Materials and Methods

All samples were collected as part of the official food inspection from 1993 to 1995. They were analysed according to the successfully tested method for determination of PCDD/PCDF

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in eggs (9), with optimisation of the extraction for each sort of food. Generally, samples were spiked with all 2,3,7,8-substituted $^{13}\text{C}_{12}$ -labelled PCDD/PCDF. As recovery standard, $^{13}\text{C}_{12}$ -labelled 1,2,3,4-TCDD was used. GC/MS-detection was performed on a VG Autospec at 10,000 resolution using a 60 m DB5-MS- or DB-Dioxin-column. The AS 200 autosampler injected 5 μl into the Multinjector of a Carlo Erba Mega GC. With every acquisition sequence, a 5 point-calibration curve was acquired in duplicate.

3 Results and Discussion

From 1993 to 1995, we have analysed 1007 food samples. In Germany, reference values for dioxins in food have been recommended up to now for milk and dairy products, only. Thus, these foodstuffs were a focal point (708 samples). Additionally, 147 egg samples, 68 fish samples, 19 meat samples and 65 vegetable samples were analysed. The following table summarises the results (in pg I-TEQ/g fat for food of animal origin, in pg I-TEQ/kg fresh weight for fruits and vegetables):

food	content in food according to BGA calculations for Germany (1986 - 1991)	content in food in the south-western part of Germany (1993 - 1995)	consumption (g)	PCDD/F intake in pg I-TEQ according to previous data	PCDD/F intake in pg I-TEQ according to new data
milk	1.8	0.8	8.9 ⁵⁾	16.0	7.1
cheese	2.2	0.8	4.7 ⁵⁾	10.3	3.8
butter	1.1	0.8	14.0 ⁵⁾	15.4	11.2
Σ milk and milk products			27.6 ⁵⁾	41.7	22.1
beef	2.7	0.7	8.3 ³⁾	22.4	5.8
pork	0.3		23.2 ⁵⁾	7.0	(7) ¹⁾
chicken	2.2		1.7 ³⁾	3.7	(4) ¹⁾
Σ meat			33.2 ⁵⁾	33.1	16.8 ⁴⁾
eggs	1.5	1.4 ²⁾	3.9 ³⁾	5.9	5.5
fish	31 - 43	8	1.0 ⁵⁾	33.9	8
fruit	15 ³⁾		130 ⁶⁾	2.0	(2.0) ¹⁾
vegetables	15 ³⁾	15 ³⁾	244 ⁶⁾	3.7	3.7
others				7.0	(7) ¹⁾
total intake (pg)				127.3	65.1 ⁴⁾
intake (pg I-TEQ/kg b.w. /day)				1.82	0.93 ⁴⁾

1) assumed value

3) pg I-TEQ/kg fresh weight

5) consumption of fat (g)

2) eggs from cage chicken

4) including assumed values

6) consumption of fresh weight (g)

These data show that the actual contamination of food in the south-western part of Germany is considerably lower than previously calculated for Germany in general, above all for the most important foodstuff of animal origin. Thus, obviously the measures to reduce the dioxin release have been successful.

For some sorts of food, the statistical data seemed not to be sufficient to calculate exactly the actual intake. In these cases, the former BGA calculations were adopted unchanged. This uncertain statistical data base seems to be of relatively low importance. As a result, the mean daily intake was calculated as 0.93 pg I-TEQ/kg b.w./day (assuming 70 kg b.w., as in the former BGA study). Thus, the actual dioxin intake in the south-western part of Germany is below the recommended intake regarding the value of precaution, if the amounts of food which were taken as a basis by the BGA are really consumed.

The former BGA study and the duplicate studies follow different principles of deriving the intake data: The calculations previously presented by the BGA are based upon previous dietary habits of the German population and PCDD/PCDF analyses of selected food samples. These estimations contain possible uncertainties, above all the use of a generalised standard for the assumption of the average food consumption. For the estimation of the actual PCDD/PCDF intake, a changing consumption attitude can lead to different results. Most important would be a change of consumption of food of animal origin, as milk, meat, fish, eggs and their products contribute about 90 % of the dioxin intake through food.

In duplicate studies, the persons involved have to collect a second portion of the meals consumed (so called „duplicates“) including snacks and beverages. For reliable results, WHO recommended the participation of seven male and seven female volunteers. Samples have to be collected on consecutive days repeatedly during the year. Thus, duplicate studies give exact results for a small number of individuals representing a small area and a limited consumption habit. Furthermore, these specific data can differentiate between men and women for both individual consumption and body weight.

As already mentioned, a duplicate study found a mean daily intake of 0.79 pg I-TEQ/kg b.w./day for women and of 0.91 pg I-TEQ/kg b.w./day for men. Our calculation using the former BGA approach comes to the same conclusion: The actual average intake of PCDD/PCDF is below the recommended value of precaution in the south-western part of Germany, as well. However, as the duplicate analyses demonstrate, there is a wide range of individual intake. Thus, under the aspect of preventive health care for those whose intake exceed the value of precaution, it is recommendable to continue the efforts to reduce the dioxin release.

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