

## Low Levels of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans in Cow 's Milk from South Germany

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### Introduction

It is generally accepted that the consumption of cow 's milk and dairy products is one of the main routes of human exposure to polychlorinated dibenzo-p-dioxins (PCDDs) and Dibenzofurans (PCDFs)<sup>1,2</sup>. A survey on PCDD/PCDF levels of 160 milk samples from farms in close vicinity to suspected dioxin sources in the federal state of Bavaria in South Germany revealed that the contamination of most samples was not increased compared to background levels in rural sites.<sup>3</sup> Only a few samples showed considerable levels of PCDDs and PCDFs with I-TEQ values exceeding 5 pg/g fat. Here we present some new data of the contamination levels of cow 's milk from these "hot spots". In order to get information about the average PCDD/PCDF levels of milk that actually reach the consumers in our state we furthermore investigated 27 bulk milk samples collected directly in the largest dairies of Bavaria.

### Materials and Methods

Milk samples from farms in close vicinity to municipal and industrial waste incinerators were collected in autumn 1989 and 1990 and in spring and autumn 1993. Bulk milk was collected directly from the receiver tank of the dairies in autumn 1992. Geographically the dairies were distributed over all regions of Bavaria.

Separation of milk fat was performed by centrifugation and extraction. After addition of <sup>13</sup>C<sub>12</sub>-labeled standards a clean-up with four chromatographic steps was carried out and finally PCDDs and PCDFs were determined by high resolution gas chromatographie / high resolution mass spectrometrie (HRGC/HRMS)<sup>3</sup>. The laboratory successfully participated in the third round of interlaboratory quality control studies (WHO 1991/92). The detection limit usually was 0.2 pg/g milk fat.

### Results

#### PCDD/PCDFs in cow 's milk from "hot spots"

Figure 1 shows some data of the contamination levels of cow 's milk from single farms in close vicinity (a few kilometers) to suspected PCDD/PCDF sources (municipal and industrial waste incinerators). The increased I-TEQ values in samples collected in autumn 1989 (5.0 - 5.7 pg I-TEQ/g fat) could not be confirmed in the following years. PCDD/PCDF levels have decreased significantly to background contamination levels (0.6 - 1.4 pg I-TEQ/g fat).

# HEX

## PCDD/PCDFs in bulk milk

Table 1 presents a summary of the concentrations of 2,3,7,8-substituted congeners and calculated I-TEQ values. All I-TEQ values lay in a very narrow range from 0.7 to 1.1 pg/g fat. The mean of 0.9 pg I-TEQ/g fat corresponds to the background contamination level of 1 pg I-TEQ/g fat in rural sites of Bavaria determined previously<sup>3)</sup>.

Table 1:  
PCDDs and PCDFs in bulk milk from Bavaria (n=27), levels in pg/g milk fat

PCDD/PCDF	min.	max.	mean *	median
2378-TCDD	< 0.2	0.25	< 0.2	< 0.2
2378-TCDF	< 0.2	< 0.2	< 0.2	< 0.2
12378-PeCDD	0.22	0.56	0.37	0.39
12378-PeCDF	< 0.2	< 0.2	< 0.2	< 0.2
23478-PeCDF	0.40	0.88	0.66	0.67
123478-HxCDD	< 0.2	0.53	0.29	0.29
123678-HxCDD	0.44	0.84	0.55	0.56
123789-HxCDD	< 0.2	0.47	0.24	0.26
123478-HxCDF	0.22	0.47	0.31	0.32
123678-HxCDF	0.20	0.54	0.26	0.27
234678-HxCDF	< 0.2	0.33	0.22	0.23
123789-HxCDF	< 0.2	< 0.2	< 0.2	< 0.2
1234678-HpCDD	0.45	1.00	0.66	0.68
1234678-HpCDF	< 0.2	0.23	< 0.2	< 0.2
1234789-HpCDF	< 0.2	< 0.2	< 0.2	< 0.2
OCDD	0.41	1.05	0.63	0.65
OCDF	< 0.2	0.29	< 0.2	< 0.2
I-TEQ *	0.69	1.12	0.87	0.89

\* not detected congeners were calculated with half of detection limit

## Conclusions

The results indicate that the average contamination level of consumer milk in the federal state of Bavaria in South Germany is very homogeneous and is not influenced by the geographical location of the dairies. These observations are in good agreement with results from the federal state of Nordrhein-Westfalen in Germany<sup>4)</sup>. PCDD/PCDF levels in Bavaria are generally low and can be attributed to the ubiquitous distribution of these xenobiotics in the environment. The decrease of PCDD/PCDF levels in cow's milk from former "hot spots" during the last years is probably due to improvements in emission control measures.

## References

- 1) Beck H., A. Droß and W. Mathar, Chemosphere **25**, 1539-1550, 1992
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- 3) Lassek E., D. Jahr and R. Mayer, Chemosphere **27**, 519-534, 1993
- 4) Fürst P., Chr. Fürst and K. Wilmers, Chemosphere **25**, 1039-1048, 1992

### Figure 1

## PCDD/Fs in cow's milk from "hot spots"



