CONTENTS OF PCDD/F IN VEGETABLES AND ANIMALS FROM AN AGRICULTURAL AREA IN AN URBAN REGION (HAMBURG, FRG)

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Introduction

Caused by the current discussion in Germany on introducing PCDD/F-threshhold values for soil and atmospheric deposition in agricultural areas, the City of Hamburg put up a program to investigate the influence of soil and atmospheric composition on the actual PCDD/F burden of locally produced food.[1]
The main agriculturally used area of Hamburg lies in the south-east adjacent to an important industrial zone. With increasing distance to this industrial area 130 food samples (91 vegetable and 39 animal derived) were analysed as well as the corresponding soil and atmospheric deposition (Results of soil and deposition analyses see contribution of Sievers et al [2]).

Materials and methods

4 kinds of vegetable plants were chosen for comparison: kale, lettuce, leek, and carrots. The samples were prepared for cook up (washing, cleaning) in order to get information about the PCDD/F burden actually incorporated by the consumer.
The 39 animal derived samples were meat, fat and eggs from ground raised chicken and ducks, fat from local calves in comparison with beef fat from the Hamburg slaughterhouse, meat, fat and/or liver from wild rabbits, deer and fish.
Animal derived samples were analysed in our laboratories, vegetable samples in the laboratory of Natec[3] , Hamburg, according to common method including HRGC/HRMS.

Main Results

Lettuce, leek and carrots showed low and uniform PCDD/F contents (0.01-0.1 ng I-TEq/kg, mean 0.016 ngI-TEq/kg) independently from corresponding soil levels (3 to 651 ngI-TEq/kg). Nevertheless the PCDD/F congener patterns of leek and soil from the same sampling sites were similar.

PCDD/F contents of kale were significantly higher, ranging from 0.09 to 0.40 ng I-TEq/kg fresh weight (0.59 - 3.03 ngI-TEq/kg dry weight). Both, kale and atmospheric deposition, showed decreasing values with increasing distance from the industrial area.

Comparison kale and deposition values

Distance of area to Industries (km)	Kale (n) median of area (ng I-TEq/kg)		Kale sample next to deposition (ng I-TEq/kg)	Deposition[2] median (pg I-TEq/m^2 d)
0 - 2	2,30	(6)	2,30	12,22
2 - 4	1,28	(4)	1,35	8,14
4 - 9	1,07	(5)	0,95	4,75
9 -18	1,10	(7)	0,71	2,42

The kale samples from this south-est area had very similar PCDD/F-patterns of a somehow regional type. This regional kale pattern showed characteristic differences to the congener patterns of the atmospheric deposition and to those of kale samples from the north of Hamburg .

Fig.1:
Charakteristic PCDD/F-pattern of a regional kale sample

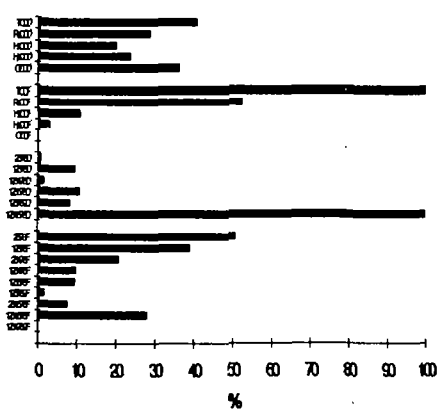
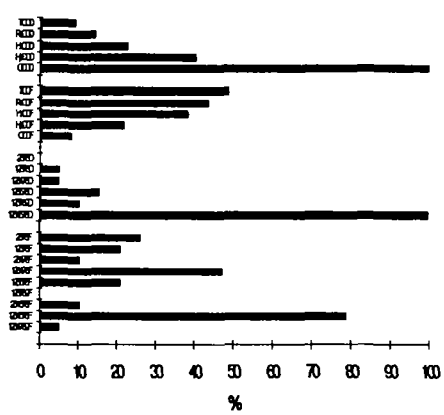


Fig.2
Pattern of deposition[2] (median) from corresponding sampling site



Concerning the animal derived samples conformity between PCDD/F-levels and patterns of corresponding soil and animal derived food were observed for ground raised chicken (chicken fat 5 to 219 ngI-TEq/kg fat). Chicken kept on contaminated ground with elevated PCDF content accumulated an identical PCDF pattern, possibly due to the incorporated amounts of soil.

Comparison of chicken fat burden and contamination of their living sites[2]

Fig.3: I-TEq

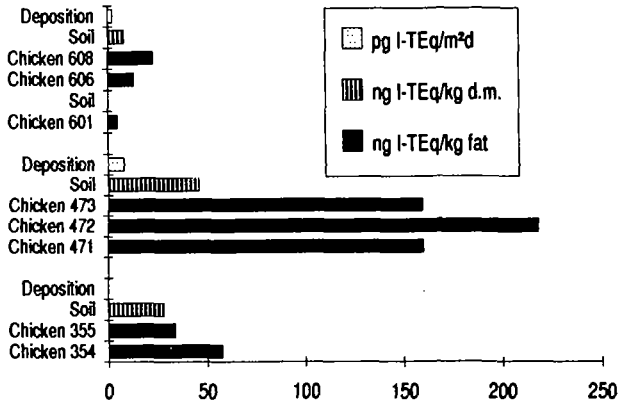


Fig.4: Sum of Furanes

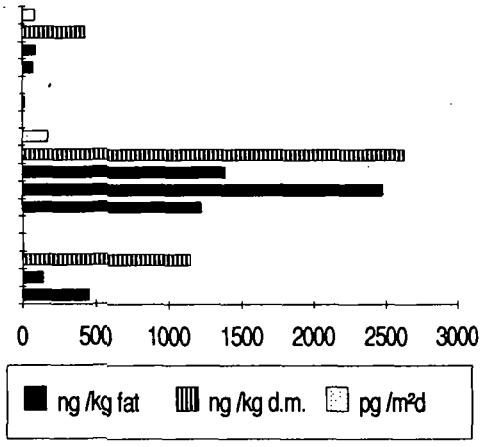
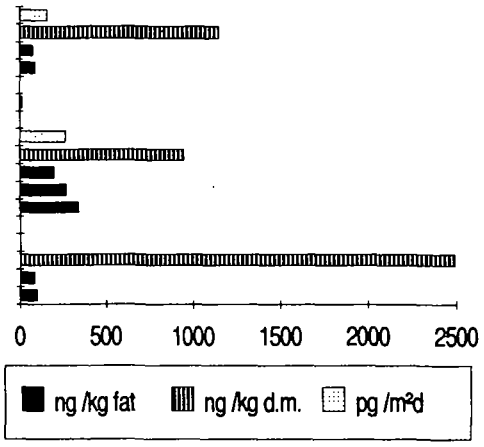


Fig.5: Sum of Dioxines



Transfers from feed to cow fat and milk were noticed in a special case. when maize silage had been prepared on HCH-contaminated ground. Both maize and so fed cows showed elevated amounts of HCH and 2.3.7.8-TCDD, a byproduct of the HCH production technology once performed by a former chemical plant in the vicinity.

- The observed PCDD/F-transfer from soil into plants was very low and independent from the levels of soil contamination.
- Transfer pathways of airborne contaminations control PCDD/F levels and patterns of kale.
- PCDD/F burdens of consumers preferring locally cultivated vegetables are not exceeding others.
- Chicken raising on soil with elevated PCDD/F content is not advisable. (see also 4)

References

1 Report of the entire investigation:
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2 Sievers S, Reich T and Schwörer R. Contents of PCDD/F in soil and atmospheric deposition in an agricultural area of an urban region.
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3 Dr.Schrader, NATEC Institut für naturwissenschaftlich-technische Dienste GmbH, Behringstraße 154, 2000 Hamburg

4 Sagunski H, Schümann M, Müller-Bagehl S, Wängler B, Päpke O, Fertmann R, Dulon M, Csicsaky M. Levels and patterns of PCDF and PCDD in eggs, chicken and human blood of residents living on a contaminated area: investigation of a possible relationship
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