

DIOXIN CONTAMINATION OF KAOLIN (*bolus alba*): MONITORING OF PCDDs AND PCDFs IN KAOLIN, FEED, AND FOODSTUFFS OF ANIMAL ORIGIN

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Introduction

During 1999, excessive dioxin levels were detected in foodstuffs of animal origin, such as dairy products, eggs, poultry, and meat. Two sources could be identified: In Belgium, used oil contaminated with PCB was fed to chicken and – more important for Switzerland – kaolin with high levels of dioxins used as an anticoagulant in feed. The origin of the high dioxin levels in kaolin is unknown until now. However, an anthropogenic influence could be excluded.

In a first phase, the contamination could be detected in several suspicious samples of feed and foodstuffs of animal origin. To check the efficiency of the restrictions on the dioxin content of feed by the Swiss authorities a monitoring program was initiated in a second phase. The data presented show the extent of the contamination in kaolin, feed, and in foodstuffs of animal origin (cow's milk, eggs, poultry, and meat).

Methods and Materials

In a first step, the lipids were extracted from the sample (liquid extraction for cow's milk and eggs, Soxhlet extraction for kaolin, feed, and meat samples). Separation of lipids using potassium silicate and retention of PCDDs and PCDFs on active carbon followed by chromatographic clean-up steps (silica gel and alumina) were based on the method described in the literature¹.

A mixture containing all 2,3,7,8-chlorosubstituted PCDDs and PCDFs was used as reference for quantification. The internal standard was a mixture containing all 2,3,7,8-chlorosubstituted PCDDs and ¹³C₁₂-PCDFs. ¹³C₁₂-1,2,7,8-TCDF was added as recovery standard.

Quantitative determination of the PCDDs and PCDFs was effected by GC/HRMS with single ion monitoring at a mass resolution of 10,000.

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Results and Discussion

The results of the investigation are summarized in Table 1. Maximum levels were detected in July 1999 when the contamination was discovered. Six months after the measures taken by the government were in effect, the concentrations in foodstuffs dropped back to background level.

Table 1: Maximum, minimum, and background levels of PCDDs and PCDFs detected in kaolin, feed and foodstuffs of animal origin (ng I-TEQ/kg, fat basis for feed and foodstuffs).

Material	max. level	min. level (m) background (b)
Kaolin	230	< 0.69 (m)
Feed for pigs	4.7	< 0.13 (m)
Chicken-feed	0.84	0.084 (m)
Feed for laying hens	3.9	0.022 (m)
Feed for cows	0.18	0.044 (m)
Feed for calves	5.8	0.47 (m)
Cow's milk	0.88	< 0.5 (b)
Chicken	2.9	< 1 (b)
Eggs	21	< 2 (b)
Pork	3.8	< 0.5 (b)

Kaolin: The kaolin investigated was used in the production of the feed.

Feed: The feed clearly shows the congener pattern of kaolin (high levels of hepta- and octachloro-dibenzo-*p*-dioxin).

Cow's milk: Normally, the main food for cows is locally grown grass. Commercial feed is used only for supplementing. Therefore, no excessive levels could be detected, and the results are rather supposed to reflect the range of the background dioxin contamination of dairy products of the respective regions.

Cow's meat, beef, veal: The fact that cows and cattle normally are both fed with locally grown grass is reflected in the levels which are not significantly different from the levels in cow's milk. As calves are fed with cow's milk, they are on a higher trophic level than cows and an accumulation could be expected. As the levels are similar to the levels in cows, a "dilution" of the dioxins by increase of the fat compartment due to growth is supposed.

Eggs/poultry: The different conditions used for the production of eggs (outdoor feeding of the laying hens) and the breeding of chicken (in chicken-coops) is reflected in the results: Eggs show relatively high dioxin levels with the pattern of the background contamination whereas chicken generally show lower levels with the exception of high levels accompanied by the dioxin pattern of kaolin.

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Pork: The foodstuffs used in the breeding of pork is very heterogeneous. Scraps from the production of foodstuffs are used as well as commercial feed. This is reflected in the large range of levels: Very low levels could indicate non-contaminated vegetable food components; samples with high levels exhibit the typical congener pattern of contaminated kaolin and therefore indicate contaminated feed.

Acknowledgement

This work is based on data elaborated for the Swiss Federal Office of Public Health (CH-3003 Bern) and the Swiss Federal Research Station for Animal Production (CH-1725 Posieux, Switzerland).

References

1. Smith L.M., Stalling D.L. and Johnson J.L. (1984) Anal. Chem. 56, 1830.