DIOXIN AND FURAN LEVELS IN CLAY FOR COSMETIC AND MEDICAL APPLICATION

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Introduction

Beside their importance in civil construction and ceramic production, clays are utilized in other different application areas. In the United States, high dioxin levels were found in clays used as additives in feed representing an important exposure source to humans through the ingestion of contaminated food of animal origin[1]. Similar dioxin levels were also reported in clays from Europe[2]. Furthermore, clay could be another dioxin exposure source to humans through medical and cosmetic use[3]. In Brazil, according to the National Department of Mineral Production the total clay production was 2,765,358 t in the 2005[4]. The cosmetic industry consumed 0.03% and the animal feed industry 0.24% of the total production. The objective of this study was the evaluation of dioxin concentrations in clays commercial available for cosmetic and medical use.

Materials and Methods

The nine analyzed clay samples were acquired in various stores located in the city of Rio de Janeiro, Brazil. Most of the clays were indicated for external application. An aliquot of 50 g were extracted with toluene for 24 hours in a Soxhlet apparatus. Prior extraction, the samples were spiked with all 17 ^{13}C-labeld 2,3,7,8-congeneres. The extracts were treated on a multi-layer column with silica (5% deactivated), silica covered with sulfuric acid(56:44, w/w) and silica covered with sodium hydroxide solution (1 M, 30%). The second cleanup step was realized on Florisil colmun (3% deactivated). After concentration the extract was dissolved in 20 µl isooctane.

Instrumental analyses was performed on Agilent 6890N Series gas chromatograph equipped with an Agilent 5973 mass selective detector (MSD). Chromatographic separation was achieved on DB 5ms fused silica column (60 m x 0,25 mm i.d, 0,25 µm bonded film). Ionization occurred by electron impact at 70 eV and ions were detected by selective ion monitoring. For analysis, 2 µl were injected in splitless mode.

Results and Discussion

The results for the nine analyzed are presented in table 1. The upperbound levels varied from 0.41 a 0.99 ng WHO-TEQ/Kg with average of 0.72 ng WHO-TEQ /Kg. In three samples, all 17 2,3,7,8-congeneres were below quantification limit. In the other samples, principally OCDD, OCDF, 1,2,3,4,6,7,8-HpCDD and 1,2,3,4,6,7,8- HpCDF were above quantification limit.

Table 1: Dioxin concentrations in nine commercial clays for cosmetic and medical use collected in Rio de Janeiro/Brazil

ng/kg	**Clay 1**	**Clay 2**	**Clay 3**	**Clay 4**	**Clay 5**	**Clay 6**	**Clay 7**	**Clay 8**	**Clay 9**
2,3,7,8-TCDD	< 0.25	< 0.13	< 0.25	< 0.16	< 0.15	< 0.18	< 0.13	< 0.25	< 0.25
1,2,3,7,8-PeCDD	< 0.12	< 0.17	< 0.37	< 0.20	< 0.15	< 0.16	< 0.14	< 0.29	< 0.26
1,2,3,4,7,8-HxCDD	< 0.47	< 0.19	< 0.31	< 0.22	< 0.21	< 0.17	< 0.12	< 0.26	< 0.25
1,2,3,6,7,8-HxCDD	< 0.48	< 0.17	< 0.35	< 0.20	< 0.19	< 0.20	< 0.11	< 0.25	< 0.26
1,2,3,7,8,9-HxCDD	< 0.21	< 0.21	< 0.18	< 0.27	< 0.12	< 0.15	< 0.12	< 0.20	< 0.24
1,2,3,4,6,7,8-HpCDD	< 0.50	< 0.56	1.27	0.66	< 0.23	< 0.29	< 0.31	< 0.18	1.24
OCDD	4.67	1.75	4.96	4.26	< 0.36	< 0.38	< 0.44	2.69	3.84
2,3,7,8-TCDF	< 0.13	< 0.13	< 0.16	< 0.16	< 0.14	< 0.15	< 0.12	< 0.17	< 0.17
1,2,3,7,8-PeCDF	< 0.17	< 0.22	< 0.18	< 0.21	< 0.19	< 0.16	< 0.16	< 0.24	< 0.18
2,3,4,7,8-PeCDF	< 0.17	< 0.16	< 0.17	< 0.17	< 0.15	< 0.20	< 0.20	< 0.21	< 0.25
1,2,3,4,7,8-HxCDF	1.36	< 0.20	< 0.34	< 0.28	< 0.17	< 0.16	< 0.12	< 0.20	< 0.28
1,2,3,6,7,8-HxCDF	0.62	< 0.17	< 0.38	< 0.22	< 0.16	<0.16	< 0.14	< 0.20	< 0.28
2,3,4,6,7,8-HxCDF	0.79	< 0.18	< 0.28	< 0.21	< 0.14	< 0.13	< 0.12	< 0.14	< 0.31
1,2,3,7,8,9-HxCDF	< 0.22	< 0.15	< 0.33	< 0.25	< 0.16	< 0.16	< 0.13	< 0.17	< 0.33
1,2,3,4,6,7,8-HpCDF	5.32	< 0.17	2.17	2.97	< 0.25	< 0.25	< 0.18	< 0.22	0.83
1,2,3,4,7,8,9-HpCDF	1.09	< 0.18	< 0.39	< 0.28	< 0.23	< 0.19	< 0.15	< 0.23	< 0.21
OCDF	21.55	0.44	4.85	6.03	< 0.29	< 0.36	< 0.35	< 0.27	1.89
WHO-TEQ (upperbound)	**0.96**	**0.53**	**0.99**	**0.68**	**0.52**	**0.59**	**0.48**	**0.82**	**0.88**

The low levels are considered not to present a risk to human health, principally when only dermal contact occurred. However, all upperbound levels are in the range of or slightly over the 500 pg WHO-TEQ/Kg, established as limit for dioxins in anti-caking agents in feeding-stuff[5].

Acknowledgements
The authors thank Ron Hoogenboom from RIKILT – Institute of Food Safety, Wageningen/Netherlands, for giving us the idea for this research.

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