DETERMINATION OF DIOXINS ANS FURANS IN COLOURED CANDLE WAX

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ABSTRACT

Purple candles can be produced with the pigment "violet 23" which can cause an increased exposure towards dioxins. High levels of dioxins in purple candles were reported in the national press in December 1992. In order to check whether these reports were true in our supervision district, we tested the coloured layers of 30 candles (from these, 24 purple). Although the colour "purple" was pretty much the same in the 24 candles, different mixtures of dyes were used. The three candles with the highest amounts of dioxins contained 1.8, 1.4 and 0.8 ng I-TEQ/kg wax. 83 % of all samples were contaminated below 0.5 ng I-TEQ/kg, 57 % below 0.2 ng I-TEQ/kg. These findings prove the possibility of producing low contaminated coloured waxes.

INTRODUCTION

Shortly before Christmas 1992, the national press reported on the possibility of an increased exposure towards dioxins when using purple candles. Authorities from Hamburg had found that the "Pigment Violett 23" contaminated purple candles. From the 4 candles analyzed, only one contained 33.1 ng I-TEQ/kg and 31.53 µg/kg OCDD (1). The other three candles had levels of 1.2 - 1.4 ng I-TEQ/kg and 0.25 - 0.52 µg/kg OCDD. The burning of the highly contaminated candle could lead to 40 pg TEQ/m^3.

Violet 23 is derived from chloranil. For this pigment and for Direct Blue 106, the results of the determination of PCDD and PCDF have been reported by Canadian authorities. Violet 23 pigments and Direct Blue 106 dyes contained µg/g levels of OCDD and OCDF and ng/g levels of hepta-, hexa- and pentacongeners (2). In four samples of Chloranil and one sample of Carbazole Violet, part per billion and part per million levels of hepta- and octachlorinated dioxins and furans were found (3).

FORM

EXPERIMENTAL

3 g wax are liquefied by warming, spiked with a solution of the 13C-labeled congeners with 2,3,7,8-structure, solved in 20 ml hexane (held at 50 °C) and transferred onto a Florisil column (20 g, deactivated with 3 % water). Wax is removed by elution with 80 ml hexane. PCDD and PCDF are eluted with 150 ml toluene. The residue is purified by gel chromatography on Bio-Beads S-X3 and chromatography on sulfuric acid/silica gel and Carbopack C carbon. After the addition of 13C-labeled 1,2,3,4-TCDD as recovery standard, the extract is concentrated to a final volume of 20 µl. 5 µl are injected into a Carlo Erba Multinjector (cold splitless, solvent split purge). As MS, a VG Autospec with resolution of 10,000 was used. Linearity of detection is tested by a 5-point calibaration curve in every sequence of samples.

RESULTS AND DISCUSSION

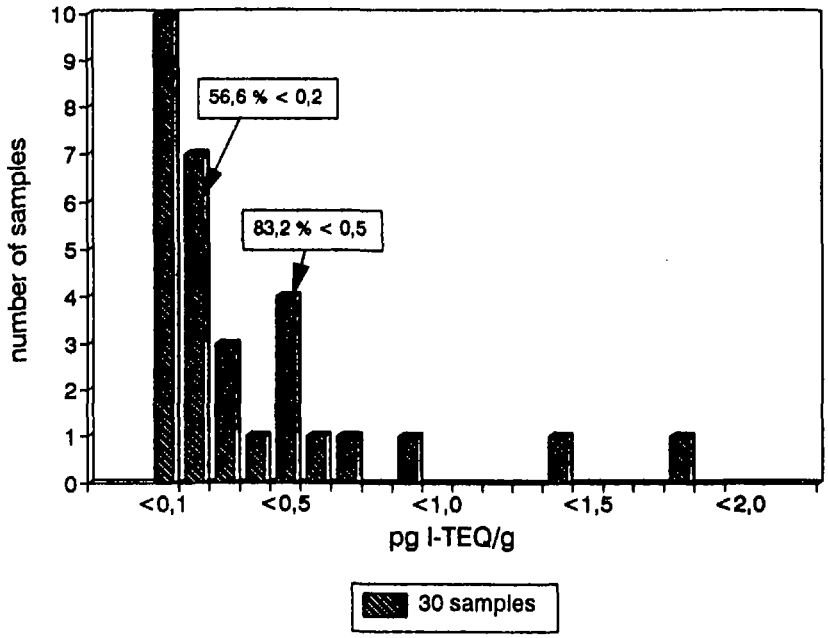
In order to check whether the Hamburg reports were significant in our supervision district, we analyzed 30 coloured candles (24 purple, 3 red, 2 blue, 1 green). 7 samples (6 purple and 1 red) had thoroughly dyed wax. In the other samples, the outer coloured layer was analyzed. The samples reflect a supply which was found by chance on the market in December 1992 in the district of Freiburg. 29 different products were examined.

Although the colour "purple" was pretty much the same in the 24 samples, different mixtures of dyes were used. Thus, a particular colour cannot give a reliable indication on the possibility of a contamination.

The three samples with the highest contamination contained 1.8, 1.4 and 0.8 ng I-TEQ/kg. 83 % of all candles had levels below 0.5 ng I-TEQ/kg, 57 % below 0.2 ng I-TEQ/kg (see figure).

83 % of the samples contained OCDD below 30 pg/g, the maximum was 190 pg/g.

The reports from Hamburg demonstrate that chloranil-derived pigments can cause an increased contamination of coloured products. Any initiative to reduce this source should be supported. Our results prove that it is possible to produce low contaminated coloured waxes. Thus, efforts to substitute high contaminated dyes have been successful.



REFERENCES

1 Staatliche Pressestelle der Freien und Hansestadt Hamburg, Pressemitteilung vom 21. August 1992 "Dioxinhaltiger Farbstoff in Kerzen und Malfarben nachgewiesen"

2 Williams DT, LeBel GL, Benoit FM. Polychlorodibenzodioxins and polychlorodibenzofurans in dioxazine dyes and pigments. *Chemosphere* 1992;24:169-180

3 Remmers J, Dupuy A, McDaniel D, Harless R, Steele D. Polychlorinated dibenzo-p-dioxin and dibenzofuran contamination in chloranil and carbazole violet. *Chemosphere* 1992; 25:1505-1508

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