COMPARISON OF LEVELS OF PCDDs AND PCDFs IN HUMAN ADIPOSE TISSUE AND BLOOD SAMPLES COLLECTED IN MADRID, SPAIN.

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Analyses of human samples in order to know human exposure to PCDDs and PCDFs have been conducted until recently almost exclusively on adipose tissue. The development of the analytical techniques within the last years has made possible also determinations in blood.

After having examined human milk and adipose tissue this study was designed in part to measure the blood levels of PCDDs/Fs from the general population of Madrid, SPAIN as an estimate of exposure to dioxins and dibenzofurans. In this presentation we focus on the PCDD/Fs blood lipid finding in 25 persons. The objetive is to determine how well adipose tisue and serum levels (see table) of dioxins correlate on lipid-weight basis. In addition to the isomeric pattern, congener profiles are studied. The data can be used to assess the mean background of PCDD/Fs from people living in Madrid.

Because the background levels of PCDD/Fs in adipose tissue lipid or milk is as low as the very low ppt level, or even lower in some cases, the chemical techniques must be extremely sensitive and specific to substitute the small amounts of blood lipid available for the larger amount of fat tissue lipid. The method we used ensure the sensisitivity as well as the selectivity required to detect and quantify low levels.

Twenty five serum samples of approximately 200 mL were collected by the Red Cross in Madrid and stored at -40°C until analysed.

A standard solution consisting of 17 ^{13}C-labelled dioxins and dibenzofurans is added to the sample. Then 100 mL of aqueous saturated ammonium sulfate solution, 100 mL of absolute ethanol and 100 mL of hexane are added to the sample. After vigorous shaking the hexane is removed and replaced with an additional 100 mL of hexane and the mixture is extracted a second time.

The combined hexane extract is then washed with concentrated sulfuric acid followed by water washings. The hexan extract is passed through two columns arranged in tandem. The first one contains separate portions of 40% cesium silicate and 40% sulfuric acid both adsorbed to silica gel. The second column consist on florisil activated at least 18 hours at 140° C. The extract proceeding from this column is transferred to the final column containing 0.25 grams of 18% carbopack C dispersed on Celite 545. Planar analytes like PCDDs, PCDFs and co-planar PCBs are eluted with toluene. The final sample extract is concentrated just to dryness.

Prior to mass spectral analysis, 13C-labelled 1,2,3,4-TCDD and 1,2,3,4,6,8-HxCDD are added as external standards.

Levels of PCDDs and PCDFs 2,3,7,8-substituted found in spanish human adipose tissue on fat weight basis (pg/g, ppt, n = 17).

ISOMER	MEAN	S.D.	TEQ
2,3,7,8-TCDD	2.76	5.03	2.76
2,3,7,8-TCDF	5.25	5.24	0.52
1,2,3,7,8-PCDF	2.04	6.47	0.02
2,3,4,7,8-PCDF	25.10	15.86	12.70
1,2,3,7,8-PCDD	12.60	8.89	6.30
1,2,3,4,7,8-HCDF	18.80	25.43	1.88
1,2,3,6,7,8-HCDF	14.90	19.05	1.49
1,2,3,7,8,9-HCDF	20.63	38.60	2.06
2,3,4,6,7,8-HCDF	10.87	21.05	1.08
1,2,3,4,7,8-HCDD	3.61	14.62	0.36
1,2,3,6,7,8-HCDD	61.80	54.60	6.18
1,2,3,7,8,9-HCDD	19.90	13.31	1.99
1,2,3,4,6,7,8-HCDF	23.70	25.45	0.23
1,2,3,4,7,8,9-HCDF	9.58	26.55	0.09
1,2,3,4,6,7,8-HCDD	267.10	146.35	2.67
OCDF	72.50	99.59	0.07
OCDD	1318.1	742.49	1.31

An AutoSpec (VG Analytical) is used in the electron impact ionization mode at hihg mass resolution. The MS is coupled directly to a Hewlett Packard 5890 gas chromatograph equipped with a 60 m, 0.25 mm i.d., bonded phase non polar DB-5 fused silica capillary column. The instrument was operating in Selected Ion Recording (SIR) mode.

Quantification for an unknown sample extract is carried out with a single injection by the internal standard method using isotope dilution and relative response factors (RRF).

As reported by other autors[1,2], on a total lipid weight basis, the adipose tissue and serum levels are well correlated. Frequently the adipose tissue levels on a fat weight basis are slightly higher.

ACKNOWLEDGEMENTS

The autors thank Dr. J.J. Ryan, Health and Welfare Canada, Tunneys Pasture, Ottawa, CANADA for his kind help in the analytical protocol development.

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