DIOXIN AND DIBENZOFURAN LEVELS IN YUCHENG PLACENTAS AND CONTROL PLACENTAS COMPARING DIOXIN/DIBENZOFURAN LEVELS WITH RECEPTOR BINDING AND ENZYME INDUCTION

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INTRODUCTION

Many studies on human tissue dioxin (PCDD), dibenzofuran (PCDF) and PCB levels have been done over the past few years, and there is increasing evidence of the persistence of dioxin-related contaminants in human tissue in cases where there has been exposure, such as the contaminated rice oil incident in Taiwan. Measurements of dioxins, dibenzofurans and PCBs have been done primarily in blood, milk and adipose tissue, and there has recently been documentation of transplacental transfer. This paper presents measurements of dioxins and dibenzofurans in placental tissue samples collected from mothers who were victims of the Taiwan rice oil poisoning with PCDFs, PCBs and PCDDs of 1979, the Yucheng incident, and compares these to U.S. control placentas, newborn tissue levels and adult blood, adipose and milk levels. In this incident, several thousand persons were poisoned when they ate food cooked with chemically contaminated rice oil. The chemicals believed to be responsible for the illness observed were primarily dibenzofurans with a smaller contribution from PCBs, and a very slight contribution from dioxins[1,2]. American samples were also chosen and analyzed for comparison purposes.

METHODS

The Yucheng placentas chosen for this study were placentas where previous receptor binding and enzyme induction had been demonstrated by one of us (GL)[3]. Control placentas were chosen from matched patients who were giving birth at the same hospitals at that time. American placentas were chosen randomly from hospitals in Binghamton, NY. The dioxin analyses were performed in a similar fashion to the techniques employed by the laboratory during its successful qualification in a World Health Organization interlaboratory dioxin analysis and field study[4].

RESULTS

In Table I we present dioxins, dibenzofurans and "Dioxin Toxic Equivalents"[5,6] (TEQ) on both a wet weight and lipid basis for the placenta, and stillborn liver tissue,[7] and only on a lipid basis for adult blood,[8] adipose,[8] and milk[10] samples. The results for the placenta provided here are only preliminary, and a small section of our placenta analyses which will include 6 Yucheng placentas with varying biochemical endpoints from PCDF variation, to be presented at Dioxin 92. On a lipid basis the placenta has the lowest 2,3,7,8-TCDD level of 2.29 ppt, compared to 6.9, 5.2 and 3.5 ppt for adipose, blood and stillborn liver respectively. For the total PCDD/Fs however, the placental has the third highest level of 383 ppt, which is higher than that of human milk at 356 ppt, and the stillborn liver sample at 137 ppt. The total TEQ ranges from 12 - 41 ppt; the placenta has a TEQ value of 15 ppt.

Figure I compares the total PCDD/Fs and the total PCDD/F TEQ for the placenta, stillborn liver and adult blood, adipose and milk samples.

The Yucheng placentas from Taiwan are being analyzed to provide comparisons between exposed and unexposed tissue, as well as to provide data relating chemical levels to biochemical endpoints and to test the dioxin toxic equivalency concept for chlorinated dibenzofurans in human tissue.

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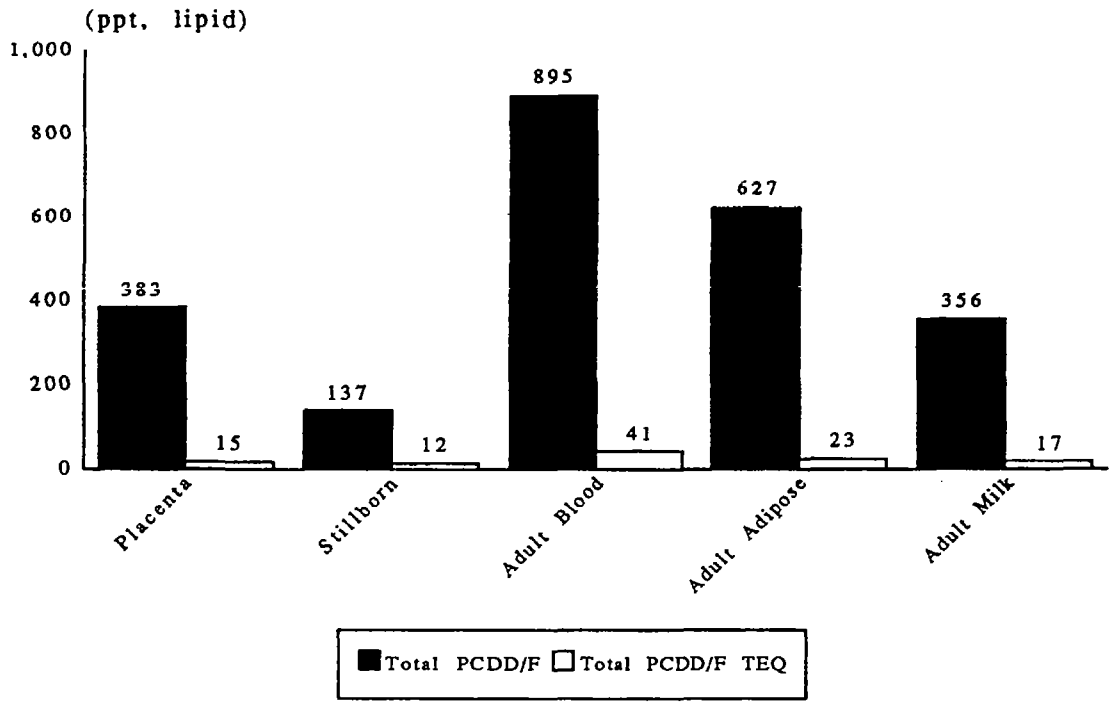
Table I
Comparison of Placenta Tissue, Stillborn Liver Tissue and Adult Blood, Adipose and Milk

		Placenta (N=1)		Stillborn Liver Mean (N=3)		Adult Samples		
Congener/Tissue	TEQ	Wet Weight	Lipid	Wet Weight	Lipid	Blood Pool (N=100)	Adipose Mean (N=20)	Milk Pool (N=42)
2,3,7,8-TCDD	1	0.03	2.29	0.11	3.5	5.2	6.9	3.3
1,2,3,7,8-PeCDD	0.5	0.139	10.5	0.22	7.1	21	7.7	6.7
1,2,3,4,7,8-HxCDD	0.1	0.069	1.17	0.13	4.2	13	-	4.95
1,2,3,6,7,8-HxCDD	0.1	0.151	11.4	0.17	5.5	84	59.3	30.5
1,2,3,7,8,9-HxCDD	0.1	0.069	5.18	0.09	2.9	15	6.3	6.2
1,2,3,4,6,7,8-HpCDD	0.01	0.654	49.4	0.47	15.1	187	82.5	42
OCDD	0.001	3.648	275.2	1.94	62.6	1174	429	233
2,3,7,8-TCDF	0.1	0.012	0.89	0.03	1	3.1	1.6	2.85
1,2,3,7,8-PeCDF	0.05	0.006	0.44	0.04	1.3	2.8	NA	0.45
2,3,4,7,8-PeCDF	0.5	0.09	6.81	0.08	2.6	13	6.8	7.3
1,2,3,4,7,8-HxCDF	0.1	0.084	6.36	0.15	4.8	15	5.6	5.55
1,2,3,6,7,8-HxCDF	0.1	0.025	1.87	0.09	2.9	14	3.7	3.2
1,2,3,7,8,9-HxCDF	0.1	<0.006	<0.56	ND(0.3)	ND(10)	ND(1.2)	1.5	<0.75
2,3,4,6,7,8-HxCDF	0.1	0.009	0.68	0.02	0.6	3.6	-	1.85
1,2,3,4,6,7,8-HpCDF	0.01	0.057	4.27	0.14	4.5	36	16.4	4.05
1,2,3,4,7,8,9-HpCDF	0.01	<0.02	<1.5	ND(0.3)	ND(10)	ND(1.8)	-	-
OCDF	0.001	0.075	5.65	ND(0.5)	ND(16)	4.2	ND(1)	4.1
Total PCDDs		5	355	3	101	798	591	327
Total PCDFs		0.4	28	1	36	97	36	29
Total PCDD/Fs		5.4	383	4	137	895	627	356
Total TEQ		0.2	15	0.3	12	41	23	17

Totals are rounded. Half of ND( ) detection limits and < used in totals. Lipid % : Placenta- 1.33%; Stillborn Livers- 3.1%; Adult blood- 0.5%, adipose- 85% and milk- 3.5%. Data for stillborn ref. #7, for adult blood ref #8, adipose ref #8, and milk ref #9.

Figure I: Comparison of Total PCDD/Fs and Total TEQ in Placent Tissue, Stillborn Liver Tissue and Adult Blood, Adipose and Milk



Placenta N=1; Stillborn N=3, Blood N=100
Adipose N=20, Milk N=42