

**DIOXIN AND DIBENZOFURAN LEVELS IN FOOD FROM THE
UNITED STATES AS COMPARED TO LEVELS IN FOOD FROM
OTHER INDUSTRIAL COUNTRIES**

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INTRODUCTION

During the past few years, as analytic procedures have improved, human tissue and food dioxin measurements have been performed on samples from a number of countries. Our previous studies of human tissue levels of dioxins and dibenzofurans showed higher levels in industrial countries, such as the U.S.A., Germany, and even the South of Vietnam, and lower levels in developing countries such as China, Thailand, Cambodia, and parts of Russia.¹ Since most dioxins and dibenzofurans in the tissues of the general population are believed to be from food,²⁻⁴ specifically from meat, milk and fish, we decided to begin analysis of food from selected countries. Surprisingly, little data on chlorinated dioxin and dibenzofuran levels is available for food from the United States. This paper is the first in our series to provide such data.

METHODS

In 1990, random samples of food were purchased from a supermarket in New York, frozen, and shipped on dry ice to the dioxin laboratories for analysis. Methods have been previously described and will not be repeated here.^{5,6}

RESULTS AND DISCUSSION

In Table I we present dioxin, dibenzofuran and dioxin toxic equivalent levels on both wet weight basis and lipid basis. Dioxin toxic equivalents (TEQ) are calculated using current estimates of toxicity.^{7,8} The samples presented here, a subsample of the total to be analyzed and presented at Dioxin '92, are various types of cheese products. On a whole weight basis, samples contain low values for 2,3,7,8-TCDD, ranging from not detected with a detection limit of .003 (ND .003) parts per trillion (ppt) in cottage cheese, to 0.07 ppt in cheese slices. Total PCDD/Fs values range from 0.9 ppt to 19 ppt. Total TEQ values range from 0.04 ppt to 0.3 ppt on a wet or whole weight basis.

In Figure I, the results are compared to total levels in food samples from Russia.⁹ Similarities can be noted especially in heavy cream and soft cream cheese, American cheese slices, and cheese with butter. Soft blue cheese and butter, both with a high fat content have the highest levels at 19 and 15 ppt, while cottage cheese and Swiss cheese have the lowest values at 0.9 and 1.1 ppt.

Additional food samples are being analyzed to provide more representative data for various types of American food, and will be compared to values from other industrial countries.^{6,9} Comparisons are also planned using our previously generated human tissue values.¹

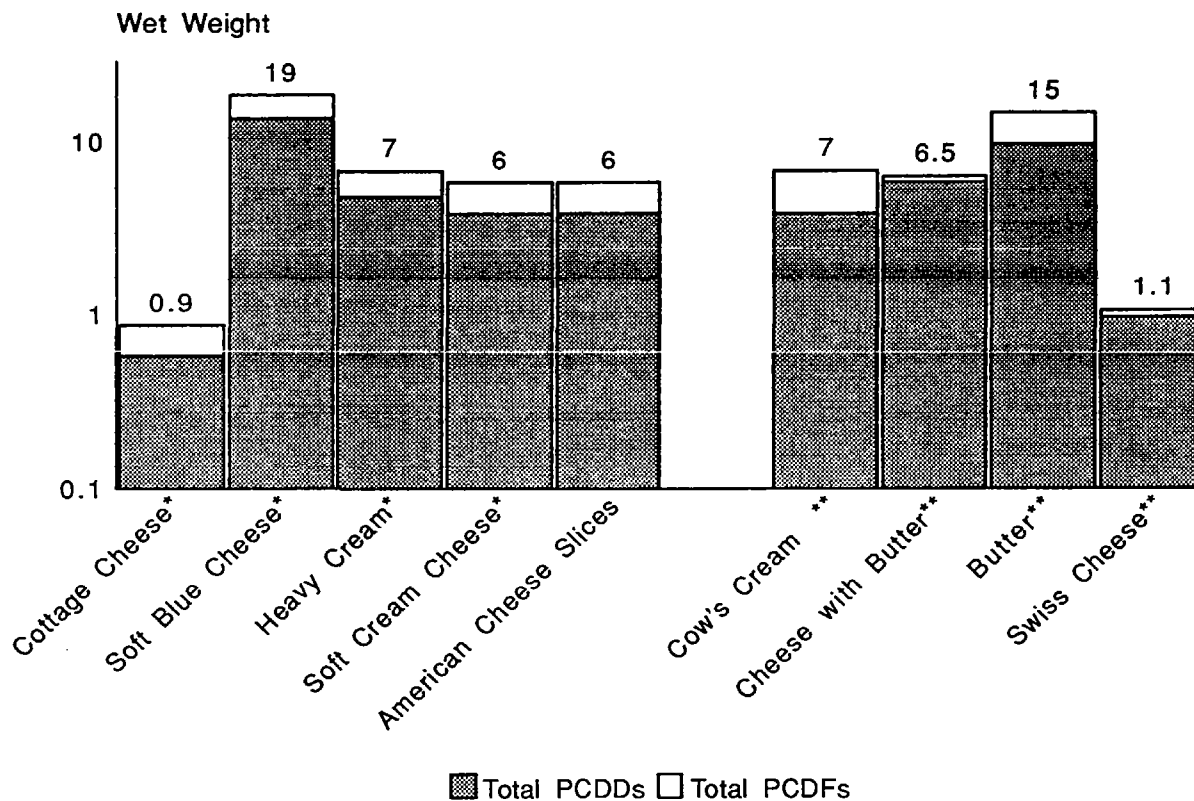
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TABLE I
DIOXIN, DIBENZOFURAN LEVELS AND TOXIC EQUIVALENTS IN AMERICAN DIARY PRODUCTS

Congener	TEF	Cottage Cheese		Soft Blue Cheese		Heavy Cream Cheese		Soft Cream Cheese		American Cheese Slices	
		Lipid	Wet Weight	Lipid	Wet Weight	Lipid	Wet Weight	Lipid	Wet Weight	Lipid	Wet Weight
2,3,7,8-TCDD	1	ND(.1)	ND(.003)	ND(.1)	ND(.05)	ND(.1)	ND(.04)	0.1	0.04	0.3	0.07
1,2,3,7,8-PeCDD	0.5	0.4	0.01	0.4	0.2	0.3	0.11	0.3	0.11	0.5	0.12
1,2,3,4,7,8-HxCDD	0.1	0.7	0.02	0.6	0.29	0.2	0.07	0.4	0.14	0.7	.017
1,2,3,6,7,8-HxCDD	0.1	2.1	0.07	3.5	1.72	2.0	0.7	1.6	0.58	1.6	0.38
1,2,3,7,8,9-HxCDD	0.1	0.7	0.02	0.6	0.29	0.4	0.14	0.4	0.14	0.8	0.19
1,2,3,4,6,7,8-HpCDD	0.01	5.8	0.18	12.0	5.88	5.9	2.11	4.2	1.51	4.8	1.13
OCDD	0.001	10.7	0.34	12.1	5.93	4.3	1.54	4.2	1.5	6.6	1.6
2,3,7,8-TCDF	0.1	0.6	0.02	0.3	0.15	0.2	0.07	0.2	0.07	0.4	0.1
1,2,3,7,8-PeCDF	0.05	ND(.2)	ND(.006)	ND(.1)	ND(.05)	ND(.1)	ND(.04)	ND(.1)	0.04	ND(.2)	ND(.05)
2,3,4,7,8-PeCDF	0.5	0.5	0.02	0.5	0.25	0.4	0.14	0.5	0.18	0.3	0.07
1,2,3,4,7,8-HxCDF	0.1	2.0	0.06	1.9	0.93	1.3	0.47	1.2	0.43	1.5	0.36
1,2,3,6,7,8-HxCDF	0.1	0.7	0.02	0.7	0.34	0.4	0.14	0.5	0.18	0.4	0.1
1,2,3,7,8,9-HxCDF	0.1	ND(.2)	ND(.006)	ND(.2)	ND(.1)	ND(.1)	ND(.04)	ND(.1)	ND(.04)	ND(.2)	ND(.05)
2,3,4,6,7,8-HxCDF	0.1	0.4	0.01	0.3	0.15	0.3	0.11	0.4	0.14	0.3	0.07
1,2,3,4,6,7,8-HpCDF	0.01	3.1	0.1	3.6	1.76	1.7	0.6	1.6	0.58	2.2	0.52
1,2,3,4,7,8,9-HpCDF	0.01	ND(.8)	ND(.03)	ND(.7)	ND(.34)	0.4	0.14	ND(.5)	ND(.18)	ND(.5)	ND(.12)
OCDF	0.001	1.8	0.06	2.2	1.08	0.8	0.29	0.8	0.29	1.3	0.3
Total PCDDs		21	0.6	29	14	13	5	11	4	15	4
Total PCDFs		10	0.3	10	5	6	2	6	2	7	2
Total PCDD/Fs		31	0.9	39	19	19	7	17	6	22	6
Total PCDD TEQ		0.7	0.02	0.9	0.4	0.5	0.2	0.5	0.2	0.9	0.2
Total PCDF TEQ		0.7	0.02	0.6	0.3	0.5	0.2	0.3	0.1	0.4	0.1
Total PCDD/F TEQ		1.4	0.04	1.5	0.7	1.0	0.4	0.8	0.3	1.3	0.3
Lipid %		3.13%		49%		35.8%		36%		23.6%	

FIGURE I: COMPARISON OF TOTAL PCDDs AND PCDFs IN DIARY PRODUCTS FROM THE UNITED STATES AND RUSSIA



Russian data from Ref. #7
 *=American food; **=Russian food