

HUMAN MILK DIOXIN AND DIBENZOFURAN LEVELS AND LEVELS OF OTHER  
CHLORINATED CHEMICALS FROM VARIOUS COUNTRIES, INCLUDING VIETNAM AND  
CAMBODIA, AS COMPARED TO THE SOVIET UNION, GERMANY, AND UNITED STATES

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ABSTRACT

This paper presents dioxin and dibenzofuran levels from human milk recently collected in a number of locations in Vietnam and Cambodia. It compares levels in these new locations to previous findings from different areas in Vietnam as well as from Germany, the United States and the Soviet Union. These data add to the worldwide data base concerning environmental contaminations in various geographical locations. PCBs, DDT, metabolites, and other chlorinated chemicals will also be compared.

INTRODUCTION

During the past 5 years, concern over dioxin levels in human milk has become widespread. Rogan and coworkers published studies on human infants exposed to PCBs within the high general population range in the U.S. and also on Yu-chen babies, documenting ill health effects in each case, in a manner consistent with published animal studies, including that of Bowman, with monkeys, and others. The World Health Organization recently sponsored and published a field study on PCDD/F and also PCB levels in human milk in various countries, with participation of a relatively small number of countries. Among the findings were that most countries, other than Vietnam, where there was a marked difference between levels in the north (lower) and south (higher), did not vary much between urban and rural areas in countries sampled.

In Northrhinewestphalia, uniquely, nursing mothers may request a chemical analysis of their milk for a very modest fee. Thus, dioxin and dibenzofuran levels as well as PCBs, DDT, DDE and other organochlorines have been measured in milk from over 400 women. This is believed to be the largest data base in the world today, for vital statistics in this area, and for measures of variation. This constitutes a standard for other countries' data.

In this paper, we are adding new data to published data and compare Cambodia, previously unstudied from the dioxin perspective, and new locations in Vietnam. Vietnam is of special interest because of discrete 2,3,7,8-TCDD contamination over 5% of the country due to spraying of Agent Orange as well as uneven industrial contamination. Comparisons will be made of dioxin and dibenzofuran congeners, total dioxins, total dibenzofurans, total dioxins plus dibenzofurans and "dioxin toxic equivalents" for the various geographical locations.

## METHODS

Dioxin analysis methodology has been previously presented and will not be repeated here. The technique has been found satisfactory by two World Health Organization interlaboratory comparison studies.

Milk was collected from nursing mothers and frozen. It was kept frozen until time of analysis, either by dry ice, blue ice, or in freezers.

## RESULTS

The reference data is presented in Table I and Graph I. The new data which is not available at the time of this manuscript preparation will be added for presentation at Dioxin 90.

## CONCLUSIONS AND DISCUSSION

Dioxin levels vary by geographic location and reflect industrialization of a given locale. Thus, dioxin levels in human milk are low in the north of Vietnam, Bangkok, Thailand and India, as previously shown. On the other hand, milk from Germany has higher levels of dioxins, followed by the United States, with the south of Vietnam also having higher levels of dioxins, both from industrial sources and from phenoxyherbicides contaminated with dioxins, which may persist for decades after contamination of the environment occurred. Cambodia, even Phnom Penh, would be expected to have lower levels of dioxins because of the rural nature of the country and the population movement from cities during recent history.

TABLE I

DIOXIN AND DIBENZOFURAN LEVELS IN HUMAN MILK FROM VARIOUS COUNTRIES (PPT, Lipid)							
Congener	TEQ	FRG <sup>1</sup>	USA <sup>1</sup> BINGHAMTON & LOS ANGELES	VIETNAM <sup>1</sup> HANOI	VIETNAM <sup>1</sup> HO CHI MINH CITY	VIETNAM <sup>1</sup> SONG BE PROVINCE	CAMBODIA (to be analyzed)
		N=185	N=42	Pool=28	Pool=38	Pool=12	
2,3,7,8,-TCDD	1	3.0	3.3	2.2	7.1	17.0	
1,2,3,7,8,-PeCDD	0.5	9.3	6.7	2.8	6.0	8.2	
1,2,3,4,7,8-HxCDD	0.1	7.8	4.95	1.9	2.9	6.6	
1,2,3,6,7,8-HxCDD	0.1	32	30.5	5.2	15.0	18.0	
1,2,3,7,8,9-HxCDD	0.1	6.3	6.2	1.8	4.2	6.0	
1,2,3,4,6,7,8-HpCDD	0.01	46	42	11.0	36.0	36.0	
OCDD	0.001	185	233	68.0	231.0	185	
2,3,7,8-TCDF	0.1	2	2.85	2.1	2.8	2.0	
1,2,3,7,8-PeCDF	0.05	.7	.45	1.0	1.4	2.0	
2,3,4,7,8-PeCDF	0.5	24	7.3	6.0	8.1	8.7	
1,2,3,4,7,8-HxCDF	0.1	7.3	5.55	4.2	5.7	12.0	
1,2,3,6,7,8-HxCDF	0.1	5.9	3.2	3.1	3.6	7.8	
1,2,3,7,8,9-HxCDF	0.1	ND (1)	ND<0.75	ND<0.5	ND<0.5	ND<0.5	
2,3,4,6,7,8-HxCDF	0.1	3.2	1.85	1.3	1.6	2.7	
1,2,3,4,6,7,8-HpCDF	0.01	5.2	4.05	3.5	8.0	10.0	
1,2,3,4,7,8,9-HpCDF	0.01	ND(1)					
OCDF	0.001	9.9	4.1	2.2	2.6	1.8	
Total PCDDs		289.40	326.65	92.90	302.20	276.80	
Total PCDFs		58.20	29.35	23.40	33.80	47.00	
Total PCDD/PCDFs		347.60	356.00	116.30	336.00	323.80	
Toxic Equivalents		26.8	16.7	8.8	18.5	31.7	

<sup>1</sup> Polychlorinated Dioxin and Dibenzofuran Levels from Human Milk from Several Locations in the United States, Germany, and Vietnam, Chemosphere, 19:1-6, pp 979-984, 1989.

## TOTAL TEQs IN HUMAN MILK FROM VARIOUS COUNTRIES

