

Dioxins, Dibenzofurans, and PCBs in Human Blood, Human Milk, and Food from Israel, the West Bank, and Gaza

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Abstract

Dioxin and dibenzofuran levels in humans and in food from the Middle East have not yet been characterized. This study involved sampling and analysis of a limited number of samples of human blood, human milk, and food from Israel and the Palestinian West Bank and Gaza areas. Samples were collected in 1995 and 1996 with the exception of one Israeli pooled blood sample which was collected in 1991. Food was obtained from Jerusalem supermarkets in Israel, and locally produced as well as imported food was purchased in Palestinian West Bank markets. For the most part samples were collected in or near Jerusalem, Bethlehem, or Gaza City. For comparison, one analysis was performed on pooled whole blood from Binghamton, New York (N=100) collected in 1996. Results of these sample analyses are presented in congener specific and dioxin toxic equivalent format.

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Introduction

In 1995 and 1996 American, Israeli, and Palestinian environmental scientists and public health physicians began for the first time to address the environmental issue of dioxins in the Middle East, beginning with studies of human blood, human milk, and food from Palestinian and Israeli areas. Because the Middle East has been involved in numerous wars, especially during the past 50 years, environmental issues have not been a major concern for governments in this region.

Methods

Food was collected in Jerusalem, Israel supermarkets and on the West Bank from local sources and also food imported from Europe. Human blood and milk were collected in 1996 in or near Bethlehem in the West Bank; Gaza City, Gaza; and Israel. All samples were frozen immediately after collection and shipped on dry ice to the dioxin laboratories. Analyses were performed as previously described and will not be presented here: Blood analyzed by Pöpke¹; blood analyzed by Ryan²; human milk analyzed by Pöpke³; human milk analyzed by Ryan⁴; food analyzed by Pöpke^{5,6}, food analyzed by Fürst⁷.

Results

Table 1 shows the total polychlorinated dibenzo-p-dioxin (PCDD), polychlorinated dibenzofuran (PCDF), and polychlorinated biphenyl (PCB) dioxin toxic equivalents (TEQs) for human blood from the Palestinian areas, Israel, and, for comparison, the United States. Included is one sample from Israel which was collected in 1991⁸. Table 2 lists the total PCDD/PCDF/PCB TEQs for human milk from Jerusalem, Bethlehem, and Binghamton, NY. In Table 3 total PCDD/PCDF TEQs in beef and lamb from the West Bank are compared to those of beef and lamb imported from Europe to the West Bank. Table 4 presents total PCDD/PCDF TEQs for hamburger (ground beef), gefilte fish, carp, ground chicken, chicken liver, cows milk, goat cheese, butter, and eggs purchased in Israel.

Discussion and Conclusions

This work documents the existence of varying levels of dioxins, dibenzofurans, and PCBs in humans and in food in the Middle East. It also demonstrates that environmental and public health specialists are interested in this field of environmental contamination and are willing to collaborate on joint projects. Sources of dioxins in the Middle East are believed to be food imported from Europe and elsewhere, pesticide and herbicide use (including 2,4-D phenoxyherbicides as shown in another paper at this meeting), incineration of plastics and toxic chemicals, and other incineration. Incineration of waste is common and dioxin standards for emissions have not yet been established. Large municipal waste incinerators are planned in Israel, and a large toxic waste incinerator to burn accumulated toxic chemicals stored since Israel became a nation in 1948 is soon to be sited in the Negev desert. Further collaborative work is planned to monitor levels of dioxin contaminants in the Middle East.

HUMAN EXPOSURE

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TABLE 1. DIOXIN, DIBENZOFURAN, AND PCB TOXIC EQUIVALENTS (LIPID BASIS, NG/KG, PPT) IN HUMAN BLOOD FROM PALESTINIAN AREAS, ISRAEL AND THE USA

	Whole Blood PNA Palestine, Gaza n=39	Whole Blood PNA West Bank n=20	Whole Blood Jerusalem Hadassah Hosp n=50	Serum Jerusalem Hadassah Hosp n=100	Serum Israel Blood Bank n=100	Whole Blood Israel 1991 n=100	Whole Blood Binghamton n=100
Total PCDD TEQ	5.23	10.04	18.54	13.21	9.04	22	18.53
Total PCDF TEQ	3.21	6.87	8.1	5.07	4.06	10	8.31
Total PCDD/F TEQ	8.44	16.91	26.64	18.28	13.10	32	26.84
Total PCB TEQ*	n.a.	7.39	11.92	n.a.	n.a.	n.a.	5.15
Total PCDD/F/PCB TEQ*	n.a.	24.3	38.56	n.a.	n.a.	n.a.	31.99

The Hadassah Hospital samples were collected by E. Richter, West Bank sample collected by J. Isaac (Applied Research Institute, Bethlehem), Blood Bank sample collected by A. Avni, Palestine, Gaza sample collected by J. Safi (Environmental Protection Research Institute). The Hadassah Hospital n= 50 and West Bank samples were analyzed by J. Ryan, and all others were analyzed by O. Papke.
n.a. = not available *Only coplanar PCBs included.

TABLE 2. DIOXIN, DIBENZOFURAN, AND PCB TOXIC EQUIVALENTS (LIPID BASIS, NG/KG PPT) IN HUMAN MILK FROM PALESTINIAN AREAS, ISRAEL, AND THE USA

	Bethlehem n=5 pooled	Jerusalem n=1	Binghamton n=5 indiv. analyses
Total PCDD TEQ	3.74	6.34	5.79
Total PCDF TEQ	2.72	3.85	2.34
Total PCDD/PCDF TEQ	6.46	10.19	8.13
Total PCB TEQ*	6.14	5.18	2.01
Total PCDD/F/PCB TEQ*	12.60	15.37	10.14

Bethlehem sample collected by J. Isaac. Bethlehem and Jerusalem analyses by J. Ryan, Health Canada. Binghamton analyses by O. Paepke, ERGO. *Only coplanar PCBs included.

**TABLE 3. DIOXIN AND DIBENZOFURAN TOXIC EQUIVALENTS
(WET WEIGHT BASIS, PG/KG, PPQ) IN FOOD FROM PALESTINIAN AREAS**

	WEST BANK (LOCAL)		WEST BANK (IMPORTED)	
	Beef	Lamb	Beef	Lamb
Total PCDD TEQ	4.55	12.67	12.29	6.16
Total PCDF TEQ	3.54	25.14	10.87	25.45
Total PCDD/F TEQ	8.08	37.82	23.16	31.61

Samples collected by Sameer Abu El Haj, Birzeit University. Analyses by O. Paepke, ERGO.

**TABLE 4. DIOXIN AND DIBENZOFURAN TOXIC EQUIVALENTS
(WET WEIGHT BASIS, PG/KG, PPQ) IN FOOD FROM ISRAEL**

	Hamburger* (Beef)	Gefilte Fish* (Frozen)	Carp* (Pond Grown)	Ground Chicken*	Chicken Liver*	Cows Milk**	Goat Cheese**	Butter**	Eggs**
Total PCDD TEQ	23	86	2	4	39	6	34	161	30
Total PCDF TEQ	31	81	20	8	31	6	48	206	75
Total PCDD/F TEQ	54	166	22	12	70	12	82	367	105

*Analyses by O. Paepke, ERGO.

**Analyses by P. Fuerst