

### LEVELS OF DIOXINS AND DIBENZOFURANS FOUND IN VARIOUS ENVIRONMENTAL SOURCES OF CONTAMINATION IN PALESTINIAN WEST BANK TERRITORY

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#### Introduction

During the past 5 years an international collaboration has been established between Palestinian, Israeli, German and American scientists to study dioxins and related persistent organic contaminants in the Middle East. This has led to a series of workshops in Israel, the West Bank, and Gaza. This collaboration has produced the first data concerning levels of dioxins, dibenzofurans, and dioxin-like PCBs in humans, food, and environment around Israel, the West Bank, and Gaza. Our prior work reported levels of dioxins in food, blood, and human milk<sup>1</sup>. Certain herbicides have also been measured for dioxin content, including samples of the phenoxy herbicide 2,4-D obtained in the Middle East, the former Soviet Union, and the United States<sup>2-4</sup>.

This paper is the first to report dioxin and dibenzofuran contamination in ash samples from a Palestinian (West Bank) municipal incinerator. The incinerator is in the city of Nablus and handles a mixture of domestic and medical waste. We also report, for the first time, levels of dioxins in dried waste water from a collection cesspool on the campus of Al-Quds University in Abud-Dis. Last, 2,4-D used in the West Bank was analyzed for dioxin and dibenzofuran congener content.

#### Materials and Methods

Samples were collected by a team from Al Quds University and shipped from the Hebrew University-Hadassah School of Medicine, Public Health Program, to ERGO laboratory, a World Health Organization certified dioxin laboratory, for dioxin analyses. Analytical methodology involving capillary column cleanup and high resolution GC/MS has been previously described.<sup>4</sup>

#### Results and Discussion

Table 1 presents the dioxin and dibenzofuran congener levels and total TEQ for all four samples in pg/g (ppt). Figure 1 presents the dioxin and dibenzofuran congener levels for the dried cesspool waste and two incinerator samples in ng/g (ppb). These results document, for the first time, contamination of Palestinian incinerator ash and cesspool waste. They show a higher TEQ contribution from dibenzofurans than from dioxins in these three samples.

The new sample of 2,4-D shows contamination with certain dioxin and dibenzofuran congeners, as did all samples previously reported by us<sup>2-4</sup>. Also, dioxin and dibenzofuran contamination was found in cesspool waste solids and incinerator ash, as has been found in similar samples from other countries.

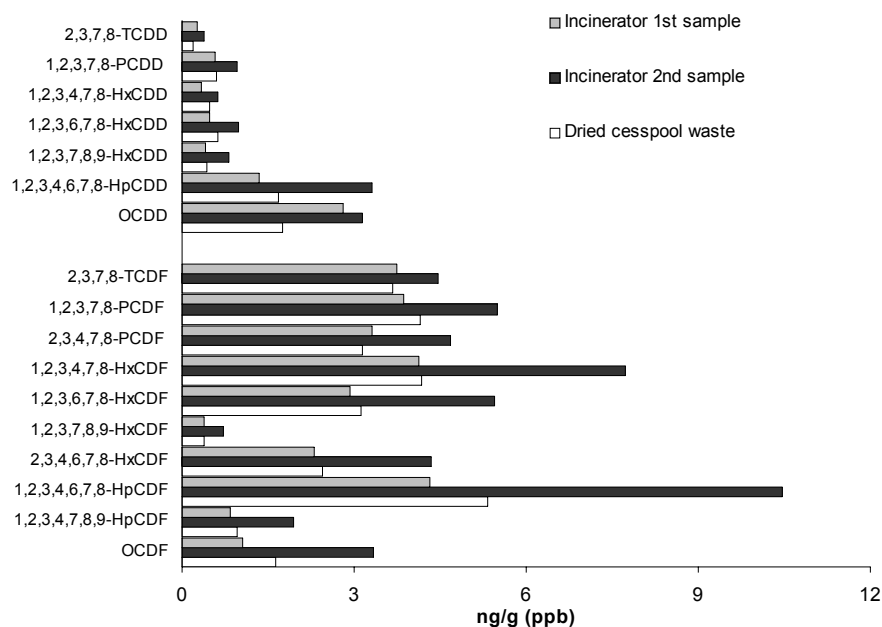
**Table 1. Measured Levels and TEQ of Dioxins and Dibenzofurans in 2,4-D, Incinerator Ash, and Dried Cesspool Waste from the Palestinian West Bank** pg/g (ppt)

<b>PCDDs</b>	2,4-D Herbicide	Dried Cesspool Waste	Incinerator 1st Sample	Incinerator 2nd Sample
2,3,7,8-TCDD	nd (4.0)	198	268	393
1,2,3,7,8-PnCDD	nd (5.0)	591	582	956
1,2,3,4,7,8-HxCDD	nd (5.0)	477	342	620
1,2,3,6,7,8-HxCDD	nd (5.0)	631	476	990
1,2,3,7,8,9-HxCDD	nd (5.0)	420	399	817
1,2,3,4,6,7,8-HpCDD	7.0	1684	1353	3317
OCDD	36.2	1763	2808	3141
Total PCDDs	43.2	5764	6228	10234
<b>PCDFs</b>				
2,3,7,8-TCDF	26.2	3664	3746	4454
1,2,3,7,8-PnCDF	nd (5.0)	4156	3874	5486
2,3,4,7,8-PnCDF	nd (5.0)	3150	3324	4685
1,2,3,4,7,8-HxCDF	9.0	4174	4135	7731
1,2,3,6,7,8-HxCDF	5.4	3113	2934	5453
1,2,3,7,8,9-HxCDF	nd (5.0)	375	390	719
2,3,4,6,7,8-HxCDF	9.2	2441	2297	4345
1,2,3,4,6,7,8-HpCDF	8.4	5337	4315	10466
1,2,3,4,7,8,9-HpCDF	nd (5.0)	961	835	1945
OCDF	14.4	1636	1048	3347
Total PCDF	72.6	29007	26898	48631
PCDD TEQ*	0.1	959	986	1625
PCDF TEQ*	5.1	3223	3258	5011
PCDD/F TEQ*	5.2	4181	4244	6636

nd: not detected, limit of detection in ( )

\*non-detects = 0

Figure 1. Measured levels of TCDD-like dioxin and dibenzofuran congeners in dry waste samples from the Palestinian West Bank ng/g (ppt)



These samples represent the beginnings of dioxin analyses of environmental samples from Palestinian and Israeli areas. The findings suggest that there may be more dioxin environmental contamination than has been previously recognized from incineration, from cesspool wastes, and from herbicides. Because of the small sample size, no attempt has been made to compare the incinerator and waste water data with those published elsewhere.

These findings suggest that environmental and human dioxin determinations may be indicated elsewhere in the Middle East where the compounds may be generated by garbage or toxic waste incinerators, and where herbicides or pesticides of the kinds contaminated with dioxins and related chemicals are prepared or used.

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