

A FOLLOW-UP STUDY OF POLYCHLORINATED DIBENZODIOXIN AND DIBENZOFURAN NEAR A PESTICIDE PLANT IN DAGU, CHINA.

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Introduction

In a paper given at Dioxin 96 in Amsterdam (1) results of a survey of possible industrial sources of dioxins and PCBs in China were presented. This survey revealed high levels of dioxins and furans around a pesticide plant in the Dagu area. It was determined that the PCDD/PCDFs generated were consistent with pentachlorophenol production. Later at Dioxin 97 in Indianapolis (2), we presented further results documenting water, soil and sediment contamination around the site and in the Bohai Bay, where the canal empties into the Pacific Ocean. This present study presents new data, further focusing on the translocation of the compounds from the plant to ditches and a major wastewater canal which empties into the Bohai Bay. Levels of PCDD/PCDFs in salt fields in the bay and in a ditch in a new residential development close to the plant are also presented.

Sampling Locations And Sample Description

The pesticide plant is located on an industrial/residential area of Dagu outside the city of Tianjin. The wastewater from smaller ditches flows through a large canal that empties into the Pacific Ocean at the Bohai Bay, approximately 10 kilometers from the plant. Just before entering the bay, the canal flows through the evaporation ponds of a salt production facility. A short description of each sample and its location is presented in Table 1.

Analytical Method

The samples were analyzed according to U.S. EPA Method 1613A (Revision B, dated April 1994) and EPA Method 1668 (EPA 821/R-97-001, 1997).

ANALYTICAL RESULTS & DISCUSSION

The results are presented in Table 2.

As expected, the results suggest that PCDD and PCDF from the pesticide plant travel down the canal and into the bay. The concentrations of PCDD and PCDF decrease at each location that is further away from the plant the congener pattern remains consistent. Distance? Previous results?

The sediment taken from in the salt evaporation ponds (Sample 6) contained PCDD and PCDFs with a similar congener pattern as the soils and sediments near pesticide plant. The bagged salt (Sample 8) taken from the production facility also showed the same congener pattern as the sediment but at lower concentrations. This may be due to contamination of the salt by the sediment. The salt brine in the evaporation ponds was not sampled for this study.

AQUATIC ENVIRONMENT

The shallow ditch contains runoff from the wastewater canal. Parts of this ditch run through residential housing projects. The high level of PCDD and PCDF detected in the sediment sample (Sample 7) also shows the same congener pattern as the samples taken adjacent to the plant.

Table 1: Sampling Locations and Sample Description

SED 1: Sediment sample collected from the head of a ditch which connects the walled manufacturing facilities to a shallow pond.
SED 2: Sediment sample collected from the shallow pond at a point where the wastewater is exiting the pond into a network of ditches that flow into a large canal (The Wastewater Canal)
SED 3: Sediment sample collected from the Wastewater Canal.
SED 4: Sediment sample collected from the mouth of Wastewater Canal where the wastewater is entering into the bay.
SED 5: Sediment sample collected from the bay at a point next to a dyke that separates the salt fields from the sea.
SED 6: Sediment sample collected from one of the salt evaporation ponds. The sample contains both sediment and solid salt.
SED 7: Sediment sample collected from an open and shallow ditch in a new housing development.
SALT: Processed salt obtained from a bag in an outdoor storage area.

Table 2: Concentrations of PCDD/PCDF in samples (in pg/gm. Dry wt.)

	<u>Sed. 1</u>	<u>Sed. 2</u>	<u>Sed. 3</u>	<u>Sed. 4</u>	<u>Sed. 5</u>	<u>Sed. 6</u>	<u>Sed. 7</u>	<u>Salt</u>
2,3,7,8-TCDD	30	87.7	15.9	8.75	ND	ND	2.17	ND
Total TCDD	1970	541	62	32	5.46	1.02	39.7	ND
1,2,3,7,8-PeCDD	1200	358	32.8	23.4	2.74	0.55	23.7	ND
Total PeCDD	24400	2200	311	123	32.4	6.62	306	ND
1,2,3,4,7,8-HxCDD	4090	4130	406	246	13.7	1.09	111	ND
1,2,3,6,7,8-HxCDD	40000	11400	1270	352	55	10.7	688	0.82
1,2,3,7,8,9-HxCDD	19200	4800	552	159	25.2	4.98	349	0.51
Total HxCDD	172000	45600	5100	1700	265	46.2	3150	3.59
1,2,3,4,6,7,8-HpCDD	383000	188000	24900	4250	596	74	12000	30.5
Total HpCDD	39900	247000	30900	5640	838	103	15100	39.5
OCDD	1000000	1160000	119000	23800	2770	198	83500	283

AQUATIC ENVIRONMENT

2,3,7,8-TCDF	645	186	23.6	17.8	2.67	0.562	15.4	ND
Total TCDF	21000	6000	1210	729	104	8.49	479	ND
1,2,3,7,8-PeCDF	1030	191	43.2	20.6	3.3	0.68	26.9	ND
2,3,4,7,8-PeCDF	2620	623	93.4	41.3	5.96	1.00	51.2	ND
Total PeCDF	54300	17500	2610	1090	142	19	1190	ND
1,2,3,4,7,8-HxCDF	18700	10700	1540	379	42.5	4.65	845	0.96
1,2,3,6,7,8-HxCDF	12100	11400	1860	1180	46.5	3.84	443	0.48
2,3,4,6,7,8-HxCDF	1210	589	64.1	26.1	3.64	ND	49.8	ND
1,2,3,7,8,9-HxCDF	3450	1770	204	42.4	8.12	1.05	127	ND
Total HxCDF	68100	38900	5910	2310	188	17.8	2710	2.28
1,2,3,4,6,7,8-HpCDF	21300	12100	1640	324	38.9	5.16	1560	1.53
1,2,3,4,7,8,9-HpCDF	5550	3800	550	78.6	11.8	1.3	409	0.50
Total HpCDF	39900	24300	3570	647	83	9.59	2750	3.02
OCDF	34600	60400	5470	2460	128	15.4	5140	4.72
ITEQ	16700	8200	1000	350	33	4.4	520	0.89

References

- (1) 16TH International Symposium on Chlorinated Dioxin and Related Compounds, Vol. 28, p262, 1996.
- (2) 17TH International Symposium on Chlorinated Dioxin and Related Compounds, Vol. 32, p38, 1997.