

ENVIRONMENTAL LEVELS-POSTER

ENVIRONMENTAL LEVELS OF ENDOCRINE DISRUPTING CHEMICALS IN WATER, SOIL, SEDIMENT, AIR AND BIOTA IN REP. OF KOREA

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Introduction

As the public is more concerned about the Endocrine disrupting chemicals(EDCs), Ministry of Environment in Korea has designed and established the mid- and long-term research plan on EDCs. Based on this plan, NIER investigated the impact of EDCs on the natural ecosystem and carried out the field test for environmental monitoring along with provincial health and environment research institutes and other certified research institutes. The goal of this study was to measure the contamination level of EDCs in a variety of environmental media, such as water, sediment, soil, air and biota and to provide a basis for the sound management of EDCs and policy-making for the control of EDCs in Korea. As the target chemical compounds for monitoring, 87 chemicals in 37 chemical groups were selected, which are known to be suspicious chemicals recommended by WWF. We also considered the amounts of chemicals in circulation, toxicities and possibilities of detection in environmental media. While 24 chemical groups were not detected in any environmental media, 28 chemicals (13 chemical groups) including dioxins were detected in at least one environmental medium. The results of the first year of environmental monitoring are reported.

Materials and Methods

Monitoring sites were selected at representative sites through the nation. The numbers of sites investigated are 43 for water, 11 for sediment, 24 for air, 35 for soil and 31 for biota. Each environmental material was sampled and analyzed following the standard methods established by National Institute Environmental Research (NIER).

Results and Discussion

87 chemicals are classified into 37 target chemical groups including organo-phosphorous and organo-chlorinated pesticides, organo tins, alkyl phenols, phthalates and dioxins. The detected chemicals and their concentrations in water, sediment, soil, air, and biota are summarized in Table 1-5, respectively. As a result, the organo-phosphorous and organo-chlorinated pesticides are not detected in all media except for biota, and PCBs were detected only in soil and biota. The concentration of 36 chemical group detected in each media are lower than or equal to those reported in Japan. In case of dioxins, the detected levels from water, sediment, soil samples are 1/5-1/250 compared to Japan's case. The Ministry of Environment and NIER are performing the investigation of exposure pathway and environmental fate on detected chemicals as well as environmental survey on endocrine disrupting chemicals.

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References

1. Annual report of environmental monitoring on endocrine disrupting chemicals in Korea, NIER and Ministry of Environment, 2000.
2. Standard methods for analysis of endocrine disrupting chemicals, NIER and Ministry of Environment, 2000
3. Annual report of environmental monitoring on endocrine disrupting chemicals in Japan, 1999

Table 1. Types and range of concentrations of detected chemicals in water

Chemicals	Range of concentrations ($\mu\text{g/l}$)	Number of detected sites (%)
Benomyl	ND-2.829	22 (51.2%)
Alkyl phenols		
4- <i>n</i> -Pentyl phenol	0.005-0.362	43 (100%)
4- <i>n</i> -Heptyl phenol	ND-0.059	40 (93.0%)
4- <i>r</i> -Octyl phenol	ND-0.333	5 (11.6%)
Nonyl phenol	0.040-5.883	43 (100%)
Pentachlorophenol	ND-0.121	1 (2.3%)
Phthalates		
Di-2-ethylhexyl phthalate	ND-1.960	20 (46.5%)
Diethyl phthalate	ND-0.540	3 (7.0%)
Di- <i>n</i> -butyl phthalate	ND-3.630	23 (53.0%)
Benzophenone	ND-0.054	7 (16.3%)
Bisphenol A	0.006-0.976	43 (100%)
Amitrole	ND-0.300	6 (14.0%)
Dioxins (pg-TEQ/l)	0-0.502	37 (86.1%)

Table 2. Types and range of concentrations of detected chemicals in sediment

Chemicals	Range of concentrations ($\mu\text{g/kg}$)	Number of detected sites (detection ratio : %)
Benomyl	ND-5.95	4 (36.4%)
Alkyl phenols		
4- <i>n</i> -Heptyl phenol	0.60-4.40	11 (100.0%)
Nonyl phenol	6.00-119.10	11 (100.0%)
Phthalates		
Di-2-ethylhexyl phthalate	ND-2044.96	7 (63.6%)
Diethyl phthalate	ND-77.45	7 (63.6%)
Di- <i>n</i> -butyl phthalate	ND-32.46	3 (27.3%)
Bisphenol A	ND-5.70	7 (63.6%)
Amitrole	ND-3.69	5 (45.5%)
Organo tin		
Tributyl tin	ND-5.96	1 (9.1%)
Dioxins (pg-TEQ/ dry-g)	0-0.98	5 (45.5%)

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Table 3. Types and range of concentrations of detected chemicals in soil

Chemicals	Range of concentrations ($\mu\text{g}/\text{kg}$)	Number of detected sites (detection ratio : %)
Benomyl	ND-8.24	12 (34.3%)
Bisphenol A	ND-54.10	19 (54.3%)
Benzophenone	ND-0.70	2 (5.7%)
Amitrole	ND-13.94	15 (42.9%)
PCBs	ND-2.40	3 (8.5%)
Dioxins (pg-TEQ/dry·g)	0-22.44	31 (88.6%)

Table 4. Types and range of concentrations of detected chemicals in air

Chemicals	Range of concentrations (ng/Nm^3)	Number of detected sites (detection ratio : %)
Hexachlorobenzene	ND-0.749	23 (95.8%)
Benzo(a)pyrene	0.261-2.552	24 (100.0%)
Di-2-ethylhexyl adipate	ND-90.772	23 (95.8%)
Phthalate		
Diethyl phthalate	ND-11.044	21 (87.5%)
Di-2-ethylhexyl phthalate	14.992-898.535	24 (100.0%)
Di-n-butyl phthalate	4.095-215.570	24 (100.0%)
Butyl benzyl phthalate	ND-5.571	12 (50.0%)
Dioxins (pg-TEQ/dry·g)	0-4.448	23 (95.8%)

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Table 5. Types and range of concentrations of detected chemicals in biota

Chemicals	Fish ($\mu\text{g}/\text{kg-wet}$) (detection ratio : %)	Amphibian ($\mu\text{g}/\text{kg-wet}$) (detection ratio : %)
Hexachlorobenzene	ND-0.19 (1.6%)	ND-1.8 (14.5%)
PCBs	ND-188.8 (98.4%)	ND
Phthalates		
Diethyl phthalate	ND-18.7 (56.5%)	ND-29.4 (16.1%)
Di-2-ethylhexyl phthalate	ND-573.9 (14.5%)	ND-301.0 (37.1%)
Di- <i>n</i> -butyl phthalate	ND-186.4 (72.6%)	ND-93.8 (35.5%)
Butyl benzyl phthalate	ND-106.1 (11.3%)	ND-206.0 (30.6%)
Dipropyl phthalate	ND-1.55 (1.6%)	ND-2.80 (1.6%)
Di- <i>n</i> -pentyl phthalate	ND-2.32 (1.6%)	ND
Diethyl phthalate	ND-10.0 (1.6%)	ND
Dicyclohexyl phthalate	ND-47.7 (8.1%)	ND-21.2 (4.8%)
Di-2-ethylhexyl adipate	ND-95.5 (16.1%)	ND-12.1 (3.2%)
Alkyl phenol		
Nonyl phenol	ND-9.8 (43.5%)	ND-4.1 (8.1%)
4- <i>t</i> -Octyl phenol	ND-1.5 (1.6%)	ND-6.0 (3.2%)
<i>n</i> -Hexyl phrnlol	ND-0.75 (6.4%)	ND
<i>n</i> -Pentyl phenol	ND-0.7 (3.2%)	ND
DDT (p,p'-DDE)	ND-4.20 (1.6%)	ND-0.17 (1.6%)
<i>trans</i> -Chlordane	ND-0.35 (1.6%)	ND
Atrazine	ND	ND-0.17 (1.6%)
Organo tins		
Tributyl tin	ND-27.21 (77.4%)	ND-0.96 (61.3%)
Dibutyl tin	ND-8.16 (74.2%)	ND-4.72 (82.3%)
Monobutyl tin	ND-3.77 (22.6%)	ND-2.86 (29.0%)
Monophenyl tin	ND-3.83 (1.6%)	ND
Diphenyl tin	ND-1.62 (3.2%)	ND
Triphenyl tin	ND-110 (38.7%)	ND-1.93 (27.4%)
Benzophenone	ND-3.0 (30.6%)	ND-1.0 (3.2%)
Metribuzin	ND-1.4 (8.1%)	ND-6.8 (33.9%)
Alachlor	ND-2.3 (1.6%)	ND-2.0 (17.7%)
Malathion	ND	ND-0.95 (3.2%)
Nitrofen	ND-2.5 (3.2%)	ND
Trifluralin	ND-0.26 (4.8%)	ND
Cypermethrin	ND-16 (17.7%)	ND-0.96 (1.6%)
Fenvalerate	ND-3.1 (4.8%)	ND-1.1 (1.6%)
Permethrin	ND-3.2 (30.6%)	ND-0.29 (24.2%)
<i>n</i> -Butylbenzene	ND	ND-0.77 (35.5%)
4-Nitrotoluene	ND-1.0 (1.6%)	ND-2.1 (3.2%)
Dioxins (pg-TEQ/ kg-wet)	0-4.053(83.9%)	0-0.636 (62.9%)