Table 2.7.1: Cohort studies on relationship of endocrine disruptors with thyroid functions

Region and subjects	Number of subjects	Follow-up period	Compound	Measure of effects	Findings	P trend
Gocmen, 1989						
Southern Anatolia, Turkey About 4000 people exposed (by intake) to HCB in 1955-59. Those who have history of porphyria in the population were investigated in 1977-87. Average 35.7 years of age, onset at an average 7.6 year of age. Retrospective study	252 (162 men, 90 women)	About 20-30 years	HCB	Frequency of symptom (%) (with symptom/total) Enlarged thyroid gland Others	3.49 (88/252)	No comparison attempted
				Scars in face or hand	83.7 (211/252)	
				Excessive pigment deposition	65 (164/252)	
				Hypertrichosis	60.6 (131/216)	
				Myotonia	37.9 (82/216)	
				Cogwheeling	41.9 (70/167)	
				Enlarged liver	4.8 (12/252)	

Table 2.7.2: Case-control study on relationship of endocrine disruptors with thyroid functions

Region and number of subjects (case/control)	Compound	Case	Control	P value
Sukdolova, 2000		Serum level (ppb)		
U.S.	総 PCB	4.8	4.7	有意差なし
Mohawk women over 30 years of age	PCB8	0.015	0.03	<0.05
Hypothyroidism 46, control 75	PCB31	0.025	0.045	<0.05
	PCB28	0.04	0.08	<0.05
	PCB49	0.015	0.035	<0.05
	PCB47+59	0.05	0.035	<0.05
	PCB71	0.005	0.025	<0.05
	PCB70	0.02	0.03	<0.05
	PCB84	0.02	0.02	<0.05
	PCB90+101	0.065	0.085	<0.05
	PCB156	Case > control		?
	PCB118	Case > control		?
	PCB153	Case = control		?
	PCB28	Case < control		?
	(For information) Thyroid TEQ (2) PCB156; 0.03 PCB118; 0.02 PCB153; 0.001 PCB28; 0.0006			

1) Read from figure
2) Calculated from data in other reports

Table 2.7.3: Synchronic studies on relationship of endocrine disruptors with thyroid functions

Region and subjects	Compound	Measure of effects	Findings	P trend
Bahn, 1980				
35 Factory workers handling PBB 89 Controls	PBB	Hypothyroidism	4 Exposed/0 control	
Murai, 1987				
	PCB	T3	Significantly higher for cases	
		T4	Significantly higher for cases	
		TSH	No difference from controls	
			Serum TCB level not correlated with T3, T4, TSH	
		Thyroid adenoma	11/74 (15%) for women	
Emmet, 1988				
U.S. Transformer repair workers 55 Exposed to PCBs (38 currently exposed, 17 exposed in past) 56 Workers without PCB exposure history as controls		T4	8.24 μg/dl for exposed/8.84 μg/dl for control	Significant
		Free T4 index	226 exposed/248 controls	Significant
Koopman-Esseboom, 1994				
Holland 105 Mother-newborn pairs	PCB dioxins	Thyroid hormones (TT4, TT3, FT4, TSH)	Mothers whose milk has high PCB levels show low T3 and T4, while the pairing children show high TSH levels 2 weeks after birth.	
Tsuji, 1997				
Japan 81 Recognized yusho patients studied 28 years after onset	PCB	Thyroid disorders	3 Graves' disease 2 Chronic thyroiditis 2 Thyroid carcinoma 1 Thyroid tumor	
		Disorder found in thyroid check only	6 Cases (TSH slightly increased in 4, slightly decreased in 2)	
		T4, T3, TSH	No difference from controls	
		Anti-thyroglobulin antibody positive	More frequent in high serum PCB group	
		Anti-microsome antibody	More frequent in high serum PCB group	
Langer, 1998（The report in 1996 is also similar）				
Slovakia Workers in a PCB manufacturing plant and residents around it 238 Plant employees, 572 controls from low pollution area 1419 people 17 years of age (454 from highly polluted urban area and 965 controls) for evaluation of thyroid gland volume	PCB	Thyroid gland volume (ml)	PCB manufacturing plant workers: 17.3, controls from low-pollution areas: 11.3	P<0.001
			17-Year-old residents in polluted cities: 9.0, control youths: 7.7	P<0.001
		Thyroid antibody (%) (PCB plant employees/controls from low pollution area)		
		TPO Ab (all subjects)	26.0/20.7	P>0.05
		TPO Ab (women)	28.4/20.5	P<0.05
		Tg Ab (women 30-61 years of age)	21.3/14.6	P<0.05
		TSHR Ab (238 matched)	10.5/2.5	P<0.001
		T4 level (nmol/l) (PCB plant employees/controls from low pollution area)		
			116.1 / 112.2	No significant difference

Table 2.7.3: Synchronic studies on relationship of endocrine disruptors with thyroid functions

Region and subjects	Compound	Measure of effects	Findings	P trend
		Frequency of normal thyroid gland (%)		
			Employed for 21-35 years: 33.6, employed for 11-20 years: 49.3	P<0.05
			Employed for 21-35 years: 33.6, matched controls 46.1	P<0.025
Mazhitova, 1998				
Kazakhstan	PCB	Thyroid hormone		No significant difference
Region near Aral Sea		TSH		No significant difference
12 Hospitalized children, 7.5-15 years of age				
Schoolchildren in Stockholm as controls				
Nagayama, 1998				
Japan	PCDD, PCDF, Co-PCB	Thyroid functions		
36 Infants 1 year of age				
Sala, 1999				
Catalonia, Spain	HCB	Hypothyroidism		
Areas with high atmospheric HCB levels			Women: With employment history 1/62, never employed 17/952	
1800 Residents of villages around an electrochemical plant including employees of the plant			Men: With employment history 1/445, never employed 0/341	
Average serum HCB level (ng/ml) of 608 residents:		Others		
54.6 for current male employees			Natural miscarriage: With employment history 8/60, never employed 143/396	
27.1 for male ex-employees			Low body weight of newborn: With employment history 2/46, never employed 51/719	
9.0 for men without employment history			Congenital malformation: With employment history 1/46, never employed 26/719	
14.9 for current female employees				
22.2 for female ex-employees				
13.5 for women without employment history				
Guo, 1999				
Taiwan		Thyroid adenoma	High frequency (20%)	
Yusho patients studied 13 years after onset				

Table 2.7.4: Ecological study on relationship of endocrine disruptors with thyroid functions

Region and subjects	Compound	Measure of effects	Findings	P trend
Sandau et al. 2002				
Quebec, Canada Cord blood samples obtained in 3 regions in 1993-96 Highly PCB-exposed Inuit people in Nunavik, subsistence fishermen around Lower North Shore of the Gulf of St. Laurence, and a southern Quebec urban center where PCB exposure was at background level	PBB PCP 4-HO-HpCS OH-PCB	FT4	Principal agent was PCP, no regional difference in concentration (628-7680 pg/g wet weight) OH-PCB concentrations: 553 (238-1750) pg/g wet weight in Lower North Shore, 286 (103-788) pg/g wet weight in Nunavik, 234 (147-464) pg/g wet weight in Southern Quebec Average of total plasma PCB concentration (sum of 49 congeners): 2710 (525-7720) ng/g wet weight in Lower North Shore, 1510 pg/g wet weight in Nunavik, 843 pg/g wet weight in Southern Quebec Total HO-PCB significantly correlated with total PCB (logarithmic transformation) ($r = 0.69$, $p < 0.001$) FT4 level (logarithmic transformation) inversely correlated with total chlorinated phenols in Nunavik and Lower North Shore groups	

Table 2.7.5: Intervention study on relationship of endocrine disruptors with thyroid functions

Region and subjects	Compound	Measure of effects	Findings
Pelletier et al. 2002			
Quebec, Canada 16 Obese men Nonmacronutrient-specific energy-restricted diet for 15 weeks	b-HCH DDT HCB mirex oxychlordane trans-nonachlor alroclor-1260 PCBs	T3 Resting metabolism rate (RMR)	Significant decrease of T3 level and RMR after weight loss program Significant increase of concentrations of 13 organochlorines during weight loss program Changes in organochlorine concentration inversely correlated with changes in serum T3 level (significant for p,p'-DDT, HCB, alochlor-1260, PCB-28, PCB-99, PCB-118 and PcB-170) and RMR (significant for HCB and PCB-156) after correction for weight loss

P trend