

Table 2.1.1: Cohort studies on relationship of endocrine disruptors with breast cancer

Region and subjects	Number of subjects	Follow-up period	Compound	Confounders considered	Relative risk (SMR, SIR, etc.) by category				
					1	2	3	4	P trend
Bibbo, 1978 United States RCT Groups treated and not treated with DES in 1951-52	2162; 840 exposed, 806 unexposed (interviewed were exposed 693 and unexposed 668)	Up to 1976-77	DES	Age of menarche, number of pregnancies, number of children delivered, age of menopause, history of reserpine use, oral contraceptive use, estrogen therapy, hysterectomy, family history, body height (no difference between exposed and unexposed group)	Prevalence: 32 (4.6%) exposed, 21 (3.1%) unexposed, P = 0.16				
Brian, 1980 United States Women DES-administered at Mayo Clinic Control from general public Investigation period 1974-78 Retrospective study	408		DES		Number of breast cancer patients in DES-administered group: 8 Expected number of breast cancer patients in general public: 9.4 (8.1 for parous women only)				
Saracci R, 1991 Cohorts from Australia, Austria, Canada, Denmark, Finland, Italy, Holland, New Zealand, Sweden and U.K. Retrospective study	18390 (16863 men, 1527 women) 13482 exposed, 416 probably exposed, 3951 unexposed, 541 unknown	1955-88 (varies by cohort)	Chlorophenoxy herbicides		SMR (95% CI) (deaths observed) Exposed: 30 (1-166) (1) Probably exposed: none Unexposed: 114 (31-293) (4) Unknown: 0 (0-1537) (0)				
Colton, 1993 United States Mothers DES-administered and not administered in 1940-60 Studied in 1989 Retrospective study	3029 Exposed, 3029 unexposed		DES	Age of menarche, number of miscarriages before the first delivery, age of the first delivery, weight of the first child, BMI, frequency of breast cancer check, breast cancer self-check, mammography history (only miscarriage was slightly more in the exposed group)	Relative incidence risk (95% CI): 1.29 (1.03-1.60) Effect of DES did not increase with time elapsed after exposure.				
Calle, 1996 United States Cancer Prevention Study 2 Pregnant women without cancer history	501,536	1982-91	DES	Age when interviewed, race, family history, BMI, education, smoking history, alcohol intake frequency, galactocele, age of menarche, age of the first delivery, age of menopause, oral contraceptives, estrogen therapy, natural miscarriage (adjusted)	Relative mortality risk (95% CI): 1.34 (1.06-1.69) Exposure 35 years ago or earlier: Exposure less than 35 years ago:				

Region and subjects	Number of subjects	Follow-up period	Compound	Confounders considered	Relative risk (SMR, SIR, etc.) by category				
					1	2	3	4	P trend
Boston, U.S. Mothers Study cohort (1980s) and Dieckmann Study cohort (1950s)	7560 (3844 exposed, 3716 unexposed)	Up to end 1994	DES	Age, calendar year, age x calendar year (adjusted) Age at participation in the program, age, calendar year, BMI, education, family history, age of menarche, oral contraceptives, miscarriage, age of the first delivery, pregnancy, age of menopause, hormone therapy, hysterectomy, smoking history (e.g. more miscarriages in the exposed group)	Relative mortality risk				
Palmer JR, 2002 Boston, U.S. The national Cooperative Diethylstilbestrol Adenosis Project(DESAD) Dieckmann Study cohort(1950s) Women's Health Study	6916 (4821 exposed, 2095 unexposed)	Up to 1997	DES	(Adjusted) Year of birth, age of menarche, age of the first delivery, number of deliveries	Relative incidence risk				
Reynolds P, 2004 California, U.S. The California Teachers Study cohort Baseline survey in 1995; pesticide use estimated within a 0.5 mile radius of each subject's residence in 1993-95	114,835, of whom 1552 had a first breast cancer	Up to 1996-99			<1 lb/mi2	1st-49th percentiles	50th-74th percentiles	>=75th percentile	
			probable or likely human carcinogens		1.00	0.95 (0.81-1.10)	0.93 (0.75-1.15)	1.07 (0.86-1.32)	
			Possible or suggestive human carcinogens		1.00	0.96 (0.84-1.11)	0.82 (0.67-1.01)	1.06 (0.87-1.29)	
			mammary carcinogens		1.00	0.82 (0.67-1.00)	0.86 (0.65-1.13)	1.15 (0.90-1.48)	
			endocrine disruptors		1.00	0.97 (0.84-1.11)	0.87 (0.71-1.05)	1.03 (0.86-1.25)	
			anticholinesterases		1.00	1.04 (0.90-1.19)	0.83 (0.68-1.03)	1.09 (0.89-1.33)	
			organochlorines		1.00	1.06 (0.79-1.43)	0.82 (0.52-1.32)	0.99 (0.63-1.55)	
			simazine		1.00	0.91 (0.71-1.15)	0.91 (0.65-1.28)	1.11 (0.81-1.50)	
			diuron		1.00	0.77 (0.57-1.03)	1.01 (0.69-1.47)	1.04 (0.73-1.49)	
			oryzalin		1.00	0.65 (0.48-0.86)	0.96 (0.68-1.35)	0.95 (0.67-1.35)	
			propargite		1.00	0.84 (0.65-1.09)	1.00 (0.71-1.41)	1.03 (0.74-1.45)	
			methyl bromide		1.00	1.09 (0.91-1.31)	1.08 (0.83-1.40)	0.98 (0.74-1.28)	

Table 2.1.2: Nested case-control studies on relationship of endocrine disruptors with breast cancer

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Wolff, 1993		Average level in serum (ng/ml)								
U.S. Chosen from participants in Women's Health Study (14,290), 58/171 in cohort	DDE	11	7.7	0.03	1.00	1.67 (P>0.05)	4.37 (P<0.05)	2.31 (P>0.05)	3.68 (P<0.05)	0.035
	PCBs	8	6.7	0.06	1.00	5.18 (P<0.05)	7.02 (P<0.05)	4.10 (P>0.05)	4.35 (P>0.05)	0.16
Krieger, 1994		Average level in serum (ppb)								
California, U.S., 1964-69 46,629 Whites, 8,123 blacks, 2,288 Asians 150/150 (50/50 whites, 50/50 blacks, 50/50 Asians) in cohort	DDE	Total	43.3	43.1	No significant difference	1.00	1.29 (0.67-2.47)	1.33 (0.68-2.62)		0.431
		Whites	35.7	35		1.00	1.85 (0.57-5.95)	2.38 (0.54-10.64)		0.238
		Blacks	49.2	43.4		1.00	2.30 (0.63-8.39)	3.85 (0.93-16.05)		0.066
		Asians	45.1	50.8		1.00	0.90 (0.27-2.99)	0.71(0.23-2.18)		0.516
	PCB	Total	4.4	4.8	No significant difference	1.00	1.17 (0.66-2.10)	0.94 (0.48-1.84)		0.878
		Whites	3.6	4.2		1.00	0.96 (0.29-3.20)	0.45 (0.09-2.20)		0.373
		Blacks	4.8	4.5		1.00	1.74 (0.59-5.14)	0.45 (0.09-2.20)		0.175
		Asians	4.9	5.6		1.00	1.19 (0.40-3.51)	0.78 (0.24-2.58)		0.628
Hunter, 1997		Average level in serum (ppb) (adjusted for fat)								
U.S. Nurse's Health Study, 1989-92 372/372 in cohort	DDE	6.01	6.97	0.14	1.00	0.80 (0.45-1.43)	0.47 (0.25-0.90)	0.74 (0.40-1.36)	0.72 (0.37-1.40)	0.47
	PCBs	4.49	4.68	0.72	1.00	0.62 (0.32-1.20)	0.52 (0.25-1.06)	0.54 (0.26-1.10)	0.66 (0.32-1.37)	0.47
Pernille-Hoyer, 1998					Serum level adjusted for fat (ng/g fat)					
Denmark Copenhagen City Heart Study 7,712 followed up for 17 years 268 breast cancer patients 240/477 in cohort	Total PCBs				1.00	0.92 (0.58-1.45)	0.78 (0.48-1.26)	1.11 (0.70-1.77)		0.77
	Total DDTs				1.00	0.79 (0.45-1.39)	0.92 (0.54-1.58)	0.84 (0.49-1.45)		0.65
	DDT				1.00	1.07 (0.68-1.68)	0.91 (0.56-1.47)	1.19 (0.76-1.87)		0.57
	DDE				1.00	0.83 (0.53-1.31)	0.77 (0.49-1.22)	0.88 (0.56-1.37)		0.52
	HCH				1.00	1.13 (0.69-1.86)	1.35 (0.79-2.30)	1.36 (0.79-2.33)		0.24
	Dieldrin				1.00	1.58 (0.93-2.67)	1.96 (1.14-3.39)	2.05 (1.17-3.57)		0.01
Dorgan, 1999		Serum level								
Columbia, U.S. 7,224 Serum bank donors 1977-87 (9.5 year follow-up in cohort) 105/208	Total DDT	No significant			1.00	1.1 (0.6-1.9)	0.3 (0.1-0.7)	0.8 (0.4-1.6)		0.65
	p,p'-DDT	difference for the			1.00	1.0 (0.5-2.0)	1.1 (0.6-2.1)	0.4 (0.2-1.0)		0.05
	p,p'-DDE	ratio of the			1.00	0.9 (0.5-1.7)	0.4 (0.2-0.8)	0.8 (0.4-1.5)		0.77
	β -HCH	subjects presenting			1.00	0.5 (0.2-0.9)	0.5 (0.2-0.9)	0.6 (0.3-1.3)		0.65
	Dieldrin	levels over			1.00	0.7 (0.3-1.3)	0.8 (0.4-1.6)	0.7 (0.3-1.3)		0.44
	HCB	detection limit			1.00	2.5 (1.2-5.3)	1.9 (0.9-4.3)	2.3 (1.0-5.0)		0.38
	TotalPCB				1.00	0.7 (0.3-1.4)	1.1 (0.6-2.2)	0.7 (0.3-1.5)		0.79
	PCB-118				1.00	1.1 (0.6-2.3)	1.6 (0.8-3.2)	1.0 (0.5-2.2)		0.77
PCB-138				1.00	1.3 (0.6-2.5)	1.2 (0.6-2.3)	1.2 (0.6-2.4)		0.82	

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Helzlsouer, 1999		Average serum/plasma level (ng/g fat)								
U.S.	CLUE 1									
CLUE 1 (25,082) sampled in 1974	Total DDE	1698.9	1920.3	0.20	1.00	1.24 (0.72-2.13)	0.96 (0.55-1.67)	0.86 (0.49-1.51)	0.73 (0.40-1.32)	0.13
CLUE 2 (32,892) sampled in 1989, followed up until 1994	Total PCB	735.3	663.6	0.48	1.00	1.41 (0.79-2.50)	0.94 (0.49-1.77)	1.08 (0.59-2.01)	1.12 (0.59-2.15)	0.44
235/235 in cohort CLUE 1	CLUE 2									
105/105 in cohort CLUE 2	Total DDE	1311.9	1586.3	0.56	1.00	1.18 (0.65-2.13)	0.58 (0.29-1.17)			0.15
	Total PCB	327.7	332.9	0.58	1.00	0.78 (0.41-1.47)	0.76 (0.38-1.51)			0.6
Ward, 2000		Average serum level adjusted for fat (ng/g)								
Norway	Beta-HCH	60	63.4	0.45	1.00	1	0.7	0.7		
Serum bank donors	heptachlor epoxide	7.1	8.5	0.10	1.00	1.5	1.8	1		
150/150 in cohort	oxychlorane	10	10.9	0.23	1.00	1	1	0.9		
	trans-nonachlor	10.4	11.7	0.10	1.00	1	0	1		
	DDE	1230	1260	0.84	1.00	0.7	1	1.2		
	DDT	119.5	137.7	0.27	1.00	0.2	0.5	0.3		
	PCBgroup2B(1)	62.6	65	0.56	1.00	0.6	0.6	0.5		
	PCBgroup2A	116.3	120	0.50	1.00	0.8	0.6	0.6		
	PCBgroup2B	49.2	52	0.32	1.00	0.4	1	0.5		
	Total PCB group 2	165.2	169.8	0.59	1.00	0.9	0.8	0.8		
	Total PCB group 3	398.7	427.1	0.18	1.00	0.7	0.8	0.6		
	Total PCBs	776.1	806.6	0.47	1.00	0.6	0.8	0.5		
Wolff, 2000		Geometric mean serum level (ng/g fat)								
New York, U.S.	DDE	977	1097	No	1.00	0.81 (0.35-1.87)	0.60 (0.26-1.38)	1.30 (0.51-3.35)		0.99
Women's Health Study	PCBs	683	663	significant difference	1.00	1.55 (0.59-4.12)	1.23 (0.49-3.08)	2.02 (0.76-5.37)		0.23
14,275 healthy women, 1985-91										
148/295 in cohort										
Hoyer, 2000		Serum level adjusted for fat								
Denmark	β -HCH				1.00	1.3 (0.6-2.9)	1.2 (0.5-2.9)	1.2 (0.5-3.0)		>0.30
Copenhagen City Heart Study	total PCB				1.00	0.8 (0.4-1.5)	0.8 (0.4-1.7)	1.6 (0.8-3.3)		>0.30
(10,317 subjects, 1976-)	Congener118				1.00	0.9 (0.4-1.9)	1.1 (0.5-2.4)	1.9 (0.9-3.9)		0.17
Random samples from cohort, 25-80 years of age	Congener138				1.00	0.9 (0.4-1.9)	1.0 (0.5-2.1)	2.1 (1.0-4.4)		0.07
	Congener153				1.00	0.7 (0.3-1.4)	0.8 (0.4-1.8)	1.3 (0.6-2.6)		>0.30
	Congener180				1.00	1.2 (0.6-2.5)	1.1 (0.5-2.2)	0.9 (0.4-2.2)		>0.30
	total DDT				1.00	1.1 (0.3-3.8)	1.4 (0.4-4.3)	2.4 (0.7-7.8)		0.12
	p,p'-DDT				1.00	1.3 (0.4-4.5)	2.1 (0.6-7.0)	3.6 (1.1-12.2)		0.02
	p,p'-DDE				1.00	1.0 (0.5-2.0)	0.8 (0.4-1.6)	1.4 (0.7-2.8)		>0.30
Laden, 2001		Average plasma level (adjusted for fat, μ g/g) (n = 370/370)								
California, U.S.	DDE	0.768	0.817	0.28	1.00	0.95 (0.59-1.53)	0.51 (0.31-0.86)	0.91 (0.57-1.47)	0.82 (0.49-1.37)	0.15
Nurse's Health Study	Total PCBs	0.544	0.543	0.92	1.00	0.73 (0.44-1.21)	0.75 (0.44-1.28)	0.85 (0.49-1.47)	0.84 (0.47-1.52)	0.56
381/381 in cohort	PCB118	0.067	0.068	0.66	1.00	0.68 (0.39-1.17)	0.62 (0.36-1.06)	1.02 (0.59-1.77)	0.69 (0.39-1.22)	0.67
	PCB138	0.095	0.097	0.82	1.00	0.82 (0.49-1.37)	0.90 (0.53-1.50)	0.71 (0.41-1.20)	0.87 (0.50-1.50)	0.21
	PCB153	0.107	0.106	0.45	1.00	0.67 (0.39-1.14)	0.69 (0.41-1.15)	0.77 (0.45-1.31)	0.83 (0.47-1.48)	0.26
	PCB180	0.074	0.075	0.56	1.00	0.70 (0.41-1.20)	0.65 (0.37-1.11)	0.70 (0.41-1.19)	0.98 (0.55-1.75)	0.67

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category						
		Case	Control	P value	1	2	3	4	5	P trend	
Hoyer AP, 2001											
Denmark Copenhagen City Heart Study (random samples from 10,317 subjects, 1976-) 161/318 in cohort, 25-80 years of age	Estrogen receptor positive (n=116)										
	Hexachlorobenzene (HCB)		1.00		1.1 (0.6-1.8)	1.0 (0.6-1.7)	1.2 (0.7-2.1)			>0.20	
	Dieldrin		1.00		1.3 (0.7-2.2)	1.5 (0.8-2.7)	1.4 (0.8-2.5)			>0.20	
	Total PCBs		1.00		1.1 (0.6-1.7)	0.7 (0.4-1.2)	1.3 (0.8-2.2)			>0.20	
	p,p'-DDE		1.00		0.7 (0.4-1.29)	0.8 (0.4-1.2)	0.9 (0.6-1.5)			>0.20	
	Estrogen receptor negative (n=45)										
	Hexachlorobenzene (HCB)		1.00		0.5 (0.2-1.4)	0.8 (0.3-2.2)	0.4 (0.1-1.4)			>0.20	
	Dieldrin		1.00		1.2 (0.3-5.4)	4.9 (0.9-28.3)	7.6 (1.3-46.1)			0.01	
	Total PCBs		1.00		1.0 (0.4-2.7)	1.3 (0.4-3.9)	0.8 (0.3-2.6)			>0.20	
	p,p'-DDE		1.00		0.9 (0.3-2.5)	0.7 (0.2-2.0)	0.6 (0.2-1.7)			>0.20	
Hoyer AP, 2002											
Denmark Copenhagen City Heart Study (7,712 subjects, 1976-)162/316 in cohort, 25-75 years of age	Wild type p53										
	Dieldrin		1.00		1.00 (0.49-2.04)	1.15 (0.53-2.47)	1.20 (0.56-2.58)			0.60	
	Total PCBs		1.00		0.53 (0.28-1.04)	0.52 (0.26-1.05)	0.96 (0.50-1.83)			0.87	
	p,p'-DDT		1.00		1.54 (0.81-2.92)	0.83 (0.41-1.68)	1.32 (0.68-2.59)			0.85	
	p,p'-DDE		1.00		0.83 (0.45-1.51)	0.69 (0.36-1.33)	0.86 (0.46-1.61)			0.38	
	Total DDT		1.00		0.78 (0.36-1.66)	0.63 (0.29-1.41)	0.70 (0.32-1.55)			0.98	
	p53 mutation										
	Dieldrin		1.00		2.07 (0.48-8.88)	4.57 (0.94-22.24)	3.53 (0.79-15.79)			0.12	
	Total PCBs		1.00		1.78 (0.43-7.41)	3.82 (0.85-17.41)	3.00 (0.66-13.62)			0.13	
	p,p'-DDT		1.00		0.75 (0.22-2.59)	0.92 (0.29-2.94)	0.95 (0.30-2.98)			0.98	
p,p'-DDE		1.00		1.59 (0.50-5.05)	1.09 (0.34-3.52)	0.81 (0.23-2.84)			0.61		
Total DDT		1.00		2.05 (0.48-8.66)	1.71 (0.44-6.73)	0.88 (0.19-4.17)			0.78		
Laden F, 2002											
U.S. Nurse's Health Study, 1989-92 367/367 in cohort	All women (CYP1A1-exon7)										
	PCBs	Wild type	1.00		0.93 (0.60-1.43)	0.89 (0.55-1.45)				0.19	
		Variants	0.54 (0.24-1.22)		0.76 (0.35-1.63)	1.36 (0.60-3.12)				(P for interaction)	
	Postmenopausal women (293 pairs) (CYP1A1-exon7)										
		Wild type	1.00		1.00 (0.63-1.60)	0.97 (0.57-1.36)				0.05	
		Variants	0.52 (0.20-1.36)		1.29 (0.51-3.21)	2.78 (0.99-7.82)				(P for interaction)	
All women (CYP1A1-Msp1)	PCBs										
		Wild type	1.00		0.84 (0.54-1.30)	1.00 (0.62-1.63)				0.21	
		Variants	0.63 (0.31-1.28)		1.24 (0.66-2.339)	0.94 (0.44-2.01)				(P for interaction)	
	Postmenopausal women (293 pairs) (CYP1A1-Msp1)										
		Wild type	1.00		1.00 (0.62-1.60)	1.18 (0.69-2.01)				0.22	
		Variants	0.53 (0.27-1.23)		1.37 (0.67-2.79)	1.08 (0.47-2.48)				(P for interaction)	
O'Leary ES, 2004											
Long Island, New York, U.S. Population-based, 1980-92 105/210 in cohort	Whether the subject has lived on an agricultural land				Except residential or agricultural land	Agricultural land					
				1.0	1.5(0.8-2.9)						

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
	Any of the following was found in drinking water			1.0 (0.6-1.7)						
	2,4-D			1.2 (0.6-2.1)						
	δ-BHC			1.1 (0.6-2.1)						
	Chlordane			1.4 (0.6-3.5)						
	Dieldrin			1.1 (0.6-2.0)						
	Heptachlor epoxide			1.0 (0.4-2.7)						
	Heptachlor			1.1 (0.6-1.9)						
	1,2-Dichloropropane			1.1 (0.4-2.6)						
	Whether a pesticide-contaminated waste treatment site exists in a 1-mile radius of the residence			No		Yes				
				1.0		2.9(1.1-7.2)				

1) PCB Homologues according to the classification by Wolff et al.

Table 2.1.3: Case-control studies on relationship of endocrine disruptors with breast cancer (retrospective)

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Lopez-carrillo, 1997		Geometrical mean serum level (ng/g fat)								
Mexico Hospital-based	DDE	20.92	20.46	0.71	1.00	0.67 (0.24-1.90)	0.64 (0.22-1.90)			
	Before menopause				1.00	0.82 (0.24-2.82)	0.79 (0.27-2.28)			
	After menopause									
		Arithmetic mean serum level (ng/g fat)								
	DDT	61.45	84.53	0.23						
Schecter, 1997		Mean serum level (ng/ml)								
Hanoi, Vietnam	DDE	12.17	16.67		1.00	0.45 (0.10-2.00)	1.14 (0.23-5.68)			
Hospital-based	DDT	2.33	2.37		1.00	2.23 (0.40-12.60)	1.21 (0.15-9.65)			
21/21	Total DDT	15.9	20.95		1.00	0.43 (0.01-2.14)	1.06 (0.18-5.67)			
van't Veer, 1997		Mean DDE level in fat tissue (μ g/g)								
EURAMIC Breast Cancer Study in five European countries (Germany, the Netherlands, Northern Ireland, Switzerland, Spain) Postmenopausal women Hospital-based Healthy post-menopausal women 50-74 years of age as hospital or population control 265/341	DDE	1.35	1.51		1.00	1.14 (0.62-2.21)	0.71 (0.38-1.34)	0.48 (0.25-0.95)		
Aschengra, 1998										
Massachusetts, U.S. Population-based 5 Subjects from Cape Cod Town diagnosed with breast cancer 261/273 Chemical agents according to occupation	1 Exogenous estrogen 2 Exogenous estrogens 3 Exogenous estrogens 4 or more exogenous estrogens methoxychlor endosulfan PCB 4-sec-butylphenol 4-tert-butylphenol 4-hydroxybiphenyl nonylphenol 4-octylphenol butyl benzyl phthalate BHA bisphenolA									
						With exposure history 1.1 (0.8-1.7) 0.6 (0.3-1.2) 0.9 (0.5-1.9) 0.9 (0.5-1.9) With exposure history 0.8 (0.2-3.0) 0.8 (0.2-3.2) 3.2 (0.8-12.2) Not calculated because of less than 3 cases 0.5 (0.2-1.2) Not calculated because of less than 3 cases 1.0 (0.7-1.5) 2.9 (0.8-10.8) 0.7 (0.4-1.2) 0.8 (0.5-1.5) 0.8 (0.5-1.4)				
Moysich, 1998		Serum level adjusted for age and fat (ng/g, number of peaks is absolute number)								

Western NY, U.S. 1986-91 After menopause Hospital-based 154/192	Without lactation experience (46 cases/ 61 controls)						
	DDE	13.16	10.82	1.00	1.95 (0.58-6.67)	1.83 (0.63-5.33)	0.24
	HCB	0.45	0.39	1.00	1.26 (0.40-3.97)	1.79 (0.59-5.40)	0.22
	mirex	0.083	0.046	1.00	2.42 (0.98-4.32)		
	Total PCBs	4.63	4	1.00	1.71 (0.55-5.35)	2.87 (1.01-7.29)	0.07
	Number of PCB peaks	18.68	17.93	1.00	1.61 (0.41-3.56)	3.31 (1.04-11.3)	0.1
	Moderately chlorinated PCBs	3.43	2.9	1.00	0.73 (0.22-2.63)	3.57 (1.10-8.60)	0.08
	Highly chlorinated PCBs	0.5	0.4	1.00	0.51 (0.15-1.69)	1.53 (0.47-4.95)	0.12

Table 2.1.3: Case-control studies on relationship of endocrine disruptors with breast cancer (retrospective)

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Lopez-carrillo, 1997		Geometrical mean serum level (ng/g fat)								
Mexico Hospital-based	DDE	20.92	20.46	0.71	1.00	0.67 (0.24-1.90)	0.64 (0.22-1.90)			
	Before menopause				1.00	0.82 (0.24-2.82)	0.79 (0.27-2.28)			
	After menopause									
		Arithmetic mean serum level (ng/g fat)								
	DDT	61.45	84.53	0.23						
Schecter, 1997		Mean serum level (ng/ml)								
Hanoi, Vietnam	DDE	12.17	16.67		1.00	0.45 (0.10-2.00)	1.14 (0.23-5.68)			
Hospital-based	DDT	2.33	2.37		1.00	2.23 (0.40-12.60)	1.21 (0.15-9.65)			
21/21	Total DDT	15.9	20.95		1.00	0.43 (0.01-2.14)	1.06 (0.18-5.67)			
van't Veer, 1997		Mean DDE level in fat tissue (μ g/g)								
EURAMIC Breast Cancer Study in five European countries (Germany, the Netherlands, Northern Ireland, Switzerland, Spain) Postmenopausal women Hospital-based Healthy post-menopausal women 50-74 years of age as hospital or population control 265/341	DDE	1.35	1.51		1.00	1.14 (0.62-2.21)	0.71 (0.38-1.34)	0.48 (0.25-0.95)		
Aschengra, 1998										
Massachusetts, U.S. Population-based 5 Subjects from Cape Cod Town diagnosed with breast cancer 261/273 Chemical agents according to occupation	1 Exogenous estrogen 2 Exogenous estrogens 3 Exogenous estrogens 4 or more exogenous estrogens methoxychlor endosulfan PCB 4-sec-butylphenol 4-tert-butylphenol 4-hydroxybiphenyl nonylphenol 4-octylphenol butyl benzyl phthalate BHA bisphenolA									
						With exposure history 1.1 (0.8-1.7) 0.6 (0.3-1.2) 0.9 (0.5-1.9) 0.9 (0.5-1.9) With exposure history 0.8 (0.2-3.0) 0.8 (0.2-3.2) 3.2 (0.8-12.2) Not calculated because of less than 3 cases 0.5 (0.2-1.2) Not calculated because of less than 3 cases 1.0 (0.7-1.5) 2.9 (0.8-10.8) 0.7 (0.4-1.2) 0.8 (0.5-1.5) 0.8 (0.5-1.4)				
Moysich, 1998		Serum level adjusted for age and fat (ng/g, number of peaks is absolute number)								

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category						
		Case	Control	P value	1	2	3	4	5	P trend	
Western NY, U.S. 1986-91 After menopause Hospital-based 154/192	Without lactation experience (46 cases/ 61 controls)										
	DDE	13.16	10.82		1.00	1.95 (0.58-6.67)	1.83 (0.63-5.33)				0.24
	HCB	0.45	0.39		1.00	1.26 (0.40-3.97)	1.79 (0.59-5.40)				0.22
	mirex	0.083	0.046		1.00	2.42 (0.98-4.32)					
	Total PCBs	4.63	4		1.00	1.71 (0.55-5.35)	2.87 (1.01-7.29)				0.07
	Number of PCB peaks	18.68	17.93		1.00	1.61 (0.41-3.56)	3.31 (1.04-11.3)				0.1
	Moderately chlorinated PCBs	3.43	2.9		1.00	0.73 (0.22-2.63)	3.57 (1.10-8.60)				0.08
	Highly chlorinated PCBs	0.5	0.4		1.00	0.51 (0.15-1.69)	1.53 (0.47-4.95)				0.12
	With lactation experience (85 cases/106 controls)										
	DDE	10.36	10.44		1.00	0.76 (0.35-1.63)	1.28 (0.54-3.05)				0.44
	HCB	0.39	0.44		1.00	0.32 (0.14-0.71)	0.46 (0.20-1.08)				0.11
	Mirex	0.029	0.036		1.00	1.08 (0.52-2.25)					
	Total PCBs	4.27	4.3		1.00	0.38 (0.17-1.03)	0.71 (0.31-1.61)				0.72
	Number of PCB peaks	18.49	18.35		1.00	0.63 (0.29-1.40)	0.82 (0.37-1.83)				0.85
Moderately chlorinated PCBs	3.1	3.2		1.00	0.48 (0.23-1.07)	0.85 (0.37-1.95)				0.44	
Highly chlorinated PCBs	0.41	0.4		1.00	0.96 (0.41-2.23)	1.00 (0.40-2.49)				0.94	
Total (n = 346), low-chlorinated PCBs: 1.66 (1.07-2.88) for less than detection limit)											
Olaya-Contreras, 1998	Mean serum level (ng/ml)										
Columbia Hospital-based, 1995-96 Patients except for breast cancer from other hospitals at matched ages as control 153/153	DDE	Total	3.3	2.5	0.03	1.00	1.20 (0.64-2.25)	1.95 (1.10-3.52)			0.09
		Before menopause	3.02	2.1	0.04	1.00	1.40 (0.55-3.43)	2.46 (0.96-6.30)			0.08
		After menopause	3.45	3	0.22	1.00	1.14 (0.50-2.75)	1.85 (0.84-4.05)			0.24
Liljegren, 1998	Concentration in fat tissue										
Sweden Hospital-based (a single hospital), 1993-95 Infiltrating breast cancer 43/benign diseases 35	Total non-coplanar PCBs (ng/g fat)		1205	1149			0.7 (0.1-2.4)				
	PCB77 (ng/g fat)		5.2	4.9			2.9 (0.5-15)				
	PCB126 (ng/g fat)		206	141			0.8 (0.1-5.5)				
	PCB169 (ng/g fat)		118	105			3.2 (0.5-18)				
	DDE (ng/g fat)		767	1026			0.4 (0.1-1.2)				
	HCB (ng/g fat)		72.6	48.1			1.3 (0.3-4.5)				
							Only for estrogen receptor-positive cases after menopause				
						PCB77 3.3 (1.8-588)					
						HCB 7.1 (1.1-45)					
Mendonca, 1999	Serum level										
Brazil Hospital-based 117/350	DDE				1.00	0.95 (0.49-1.8)	1.34 (0.68-2.6)	1.12 (0.58-2.1)	0.83 (0.40-1.6)		0.79
Zheng, 1999	Adjusted mean concentration in fat tissue (ppb)										
Connecticut, U.S. 49-79 Years of age Hospital-based 304/186	DDE	784.1	736.5	0.41	1.00	1.3 (0.7-2.2)	0.9 (0.5-1.6)	0.9 (0.5-1.5)			0.46
	DDT	55.6	51.8	0.22	1.00	0.8 (0.5-1.4)	0.6 (0.4-1.1)	0.8 (0.5-1.5)			0.38

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Zheng, 1999		Mean concentration in fat (adjusted for fat, ppb)								
U.S. Hospital-based, 1994-97 40-79 Years of age 304/186	HCB	Before menopause	18.3	17.3	0.65	1.00	0.8 (0.3-2.0)	0.4 (0.2-1.1)	0.8 (0.3-2.0)	0.49
		After menopause	22.1	20.2	0.37	1.00	0.9 (0.4-1.7)	0.9 (0.4-1.8)	0.8 (0.4-1.8)	0.29
Dello Iacovo, 1999		Mean serum level (ng/ml) (Number of subjects in whom detected)								
Italy Case: Surgery in a hospital in 1997-98 Control: Healthy participants in a cohort study, 1993- 170/195	beta-HCH Heptachlor DDE DDT Endrin aldeide		1.76 (37) 2.86 (9) 9.55 (170) 2.47 (12) 4.73(29)	1.49 (16) 1.16 (19) 8.98 (195) 1.77 (11) 3.78 (22)		1.00	0.84 (0.47-1.51)	1.24 (0.70-2.20)		
Zheng, 1999		Geometric mean concentration in fat tissue adjusted for age (ppb, adjusted for fat)								
Connecticut, U.S. Hospital-based Patients who underwent surgery or biopsy, 40-70 years of age Patients with benign mammary diseases as control 304/186	Beta-HCH		27.1	26.3	0.61	1.00	0.7 (0.4-1.2)	0.8 (0.5-1.5)	0.6 (0.3-1.1)	
Moysich, 1999		Serum level (ng/g), high concentration group								
West New York, U.S. Part of participants in a case-control study on 933 postmenopausal whites Hospital-based 154/191	PCBs					1.00	Serum level (ng/g) and CYP1A1 gene polymorphism (exon 7) 1.27(0.76-2.14) (Low concentration and Ile/Ile as the reference category)			
						1.00	Low concentration group, Ile/Val + Va/Val			
						1.00	High concentration group, Ile/Ile			
						1.00	High concentration group, Ile/Val + Va/Val			
Millikan, 2000		Mean plasma level (adjusted for fat, μ g/g)								
North Carolina, U.S. Population-based Blacks 292/270 Whites 456/389	DDE	Blacks	1.96	1.69	0.29	1.00	1.12 (0.70-1.77)	1.41 (0.87-2.29)		
		Whites	0.66	0.76	0.18	1.00	0.97 (0.68-1.40)	0.98 (0.67-1.43)		
	PCB	Blacks	0.56	0.51	0.08	1.00	1.35 (0.84-2.16)	1.74 (1.00-3.01)		
		Whites	0.38	0.38	0.42	1.00	1.32 (0.92-1.90)	1.03 (0.68-1.56)		

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Stellman, 2000		Median concentration in fat tissue (ng/g)								
Long Island, U.S. Hospital-based 232/323	HCB	17.8	16.3	0.50						
	beta-HCH	19.8	15.8	0.40						
	oxychlorane	46.4	38.9	0.06						
	trans-nonachlor	51	39.6	0.90						
	DDE	419.2	374.1	0.20	1.00	1.14 (0.71-1.81)	0.74 (0.44-1.25)			0.3
	DDD	16.4	13.3	0.90						
	DDT	12.3	12.1	0.04						
	Total organochlorine pesticides	628.6	546.9	0.10	1.00	1.29 (0.80-2.08)	0.66 (0.38-1.17)			0.1
	Total PCBs	294.7	257.1	0.90	1.00	1.06 (0.67-1.69)	1.01 (0.60-1.69)			0.9
	PCB74	29.6	26.7	<0.01						
	PCB99	19.3	13.9	0.20						
	PCB118	30.4	24	0.90						
	PCB138	28.7	21.7	0.08						
	PCB146	9.2	6.9	0.80						
	PCB153	76.1	63.1	0.60						
	PCB156	11.2	9.1	0.80						
	PCB167	1.7	1.3	0.70						
	PCB170	13.5	11.2	0.80						
	PCB172	2.4	1.6	0.70						
	PCB178	3.9	3	0.90						
PCB180	42.4	33.7	0.90							
PCB183	5.8	4	0.02	1.00	1.3 (0.8-2.1)	2.0 (1.2-3.4)			Significant	
PCB187	16.2	12.8	0.50							
No dose-dependent risk increase for other PCB homologues										
Bagga, 2000										
California, U.S. Hospital-based 73/73	DDT	267.3	261.6	0.23	1.052 (0.930-1.191)					
	DDE	709.1	800	0.01	1.126 (0.792-1.603)					
	DDD	24	9.8	0.79						
	DDT+DDE+DDD	1000.4	1071.4	0.04	0.904 (0.712-1.148)					
Zheng, 2000										
Connecticut, U.S. Hospital-based 475/502	DDE	460.1	456.2	0.89	1.00	1.05 (0.76-1.47)	0.96 (0.67-1.36)			0.58
	PCBs	733.1	747.6	0.46	1.00	1.04 (0.76-1.45)	0.95 (0.68-1.32)			0.41
Demers, 2000										
	beta-HCH	15.5		0.54	1.00	0.71 (0.38-1.33)	0.85 (0.44-1.62)	0.71 (0.38-1.32)	0.83 (0.43-1.61)	
				0.86	1.00	0.60 (0.35-1.01)	0.62 (0.37-1.04)	0.86 (0.50-1.49)	0.80 (0.47-1.35)	
	DDE	386		0.39	1.00	0.85 (0.45-1.59)	0.66 (0.37-1.19)	1.54 (0.81-2.95)	1.36 (0.71-2.63)	
				0.88	1.00	0.75 (0.45-1.25)	1.06 (0.62-1.79)	0.86 (0.52-1.42)	1.00 (0.60-1.67)	
	DDT	9.1		0.70	1.00	0.85 (0.47-1.54)	1.06 (0.57-1.98)	1.07 (0.59-1.94)	1.37 (0.73-2.56)	
				0.87	1.00	0.57 (0.34-0.95)	0.50 (0.30-0.84)	0.71 (0.43-1.19)	0.81 (0.48-1.37)	
	oxychlorane	11.9		0.08	1.00	1.10 (0.58-2.09)	0.96 (0.49-1.88)	0.81 (0.41-1.61)	0.55 (0.27-1.13)	
				0.27	1.00	1.09 (0.65-1.82)	1.00 (0.59-1.69)	1.26 (0.74-2.16)	1.47 (0.83-2.62)	
	trans-nonachlor	15.2		0.10	1.00	1.25 (0.64-2.42)	1.46 (0.77-2.76)	0.59 (0.29-1.20)	0.74 (0.38-1.47)	
				0.68	1.00	0.82 (0.49-1.40)	1.53 (0.91-2.59)	0.69 (0.39-1.23)	1.20 (0.68-2.13)	
	PCB153	55		0.85	1.00	1.02 (0.54-1.94)	0.99 (0.50-1.93)	0.64 (0.33-1.23)	1.07 (0.54-2.12)	
				0.53	1.00	1.12 (0.66-1.88)	0.94 (0.55-1.62)	1.18 (0.68-2.05)	1.28 (0.74-2.19)	

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Aronson, 2000		Geometrical mean concentration in fat tissue (μ g/kg fat; mg/kg fat for Arochlor 1260)								
Ontario, Canada Hospital-based 217/213	PCB 99	Before menopause	19.5 (17.9-21.2)	41.5 (36.1-47.6)	1.00	0.95 (0.42-2.16)	Q3+4; 1.63 (0.71-3.72)			
		After menopause			1.00	2.20 (0.87-5.52)	Q3+4; 1.70 (0.74-3.91)			
	PCB 105	Before menopause	7.1 (6.4-7.8)	6.3 (5.7-7.0)	1.00	1.29 (0.52-3.20)	Q3+4; 3.91 (1.73-8.86)			
		After menopause			1.00	0.89 (0.38-2.06)	Q3+4; 1.49 (0.70-3.16)			
	PCB 118	Before menopause	30.3 (27.7-33.2)	24.7 (22.4-27.3)	1.00	1.04 (0.46-2.35)	Q3+4; 2.85 (1.24-6.52)			
		After menopause			1.00	1.39 (0.57-3.41)	Q3+4; 1.58 (0.70-3.58)			
	PCB 138	Before menopause	73.8 (68.9-79.1)	66.8 (62.1-71.9)	1.00	1.19 (0.56-2.54)	Q3+4; 1.52 (0.69-3.35)			
		After menopause			1.00	1.65 (0.71-3.83)	Q3+4; 1.69 (0.79-3.60)			
	PCB 153	Before menopause	105.2 (98.5-112.3)	98.3 (91.8-105.3)	1.00	0.88 (0.40-1.93)	Q3+4; 1.06 (0.48-2.34)			
		After menopause			1.00	2.01 (0.84-4.79)	Q3+4; 1.61 (0.72-3.63)			
	PCB 156	Before menopause	18.6 (17.5-19.9)	17.2 (16.0-18.5)	1.00	1.90 (0.87-4.13)	Q3+4; 1.35 (0.61-2.98)			
		After menopause			1.00	2.09 (0.90-4.86)	Q3+4; 1.41 (0.65-3.06)			
	PCB 170	Before menopause	34.3 (32.1-36.6)	32.0 (29.7-34.4)	1.00	0.83 (0.39-1.78)	Q3+4; 0.89 (0.41-1.91)			
		After menopause			1.00	3.27 (1.44-7.44)	Q3+4; 1.63 (0.77-3.45)			
	PCB 180	Before menopause	71.9 (67.5-76.5)	65.7 (61.5-70.2)	1.00	1.07 (0.51-2.27)	Q3+4; 0.89 (0.42-1.91)			
		After menopause			1.00	2.43 (1.09-5.43)	Q3+4; 1.77 (0.85-3.69)			
	PCB 183	Before menopause	10.3 (9.6-11.1)	9.5 (8.8-10.2)	1.00	0.99 (0.44-2.22)	Q3+4; 1.37 (0.63-2.96)			
		After menopause			1.00	0.94 (0.42-2.10)	Q3+4; 1.16 (0.58-2.33)			
	PCB 187	Before menopause	25.7 (23.9-27.7)	24.2 (22.6-26.0)	1.00	0.75 (0.35-1.64)	Q3+4; 0.86 (0.41-1.83)			
		After menopause			1.00	0.82 (0.36-1.85)	Q3+4; 1.08 (0.52-2.28)			
	Arochlor1260	Before menopause	0.94 (0.88-1.00)	0.87 (0.81-0.92)	1.00	0.86 (0.40-1.87)	Q3+4; 1.24 (0.58-2.66)			
		After menopause			1.00	1.52 (0.66-3.49)	Q3+4; 1.53 (0.71-3.30)			
	p,p'-DDE	Before menopause	693 (615-780)	596 (530-670)	1.00	0.75 (0.34-1.62)	Q3+4; 1.52 (0.70-3.33)			
		After menopause			1.00	1.15 (0.50-2.63)	Q3+4; 1.05 (0.50-2.19)			
	p,p'-DDT	Before menopause	22.0 (19.6-24.7)	19.3 (17.3-21.6)	1.00	0.54 (0.24-1.21)	Q3+4; 1.09 (0.49-2.40)			
		After menopause			1.00	1.20 (0.55-2.63)	Q3+4; 1.05 (0.53-2.06)			
	cis-nonachlor	Before menopause	6.0 (5.5-6.5)	6.0 (5.6-6.5)	1.00	0.74 (0.33-1.70)	Q3+4; 0.67 (0.31-1.44)			
		After menopause			1.00	0.81 (0.39-1.68)	Q3+4; 0.54 (0.27-1.08)			
trans-nonachlor	Before menopause	40.4 (37.4-43.6)	41.1 (38.7-43.6)	1.00	0.93 (0.45-1.93)	Q3+4; 0.73 (0.33-1.63)				
	After menopause			1.00	0.93 (0.41-2.08)	Q3+4; 0.72 (0.34-1.49)				
Oxychlorodane	Before menopause	30.4 (28.6-32.3)	30.5 (28.8-32.2)	1.00	0.46 (0.21-0.97)	Q3+4; 0.78 (0.37-1.67)				
	After menopause			1.00	1.00 (0.44-2.26)	Q3+4; 0.66 (0.31-1.40)				
HCB	Before menopause	32.0 (29.3-34.8)	30.1 (27.8-32.5)	1.00	1.27 (0.62-2.60)	Q3+4; 1.03 (0.45-2.37)				
	After menopause			1.00	0.62 (0.25-1.49)	Q3+4; 0.62 (0.28-1.40)				

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
	Mirex	9.0 (8.1-10.0)	9.9 (8.8-11.2)		1.00	0.94 (0.42-2.10)	Q3+4; 1.72 (0.78-3.76)			
	Before menopause				1.00	0.94 (0.42-2.10)	Q3+4; 1.72 (0.78-3.76)			
	After menopause				1.00	1.53 (0.73-3.20)	Q3+4; 1.13 (0.60-2.13)			
	β -HCH	43.1 (38.0-48.9)	41.5 (36.1-47.6)		1.00	0.59 (0.27-1.30)	Q3+4; 1.01 (0.46-2.18)			
	Before menopause				1.00	0.59 (0.27-1.30)	Q3+4; 1.01 (0.46-2.18)			
	After menopause				1.00	0.86 (0.37-1.99)	Q3+4; 0.89 (0.41-1.93)			
Zehng, 2000		Adjusted geometrical mean concentration in fat tissue (ppb)								
Connecticut, U.S., 1994-97 Hospital-based 304/186	PCB	478.6	494.1	0.46	1.00	0.6 (0.4-1.0)	0.7 (0.4-1.1)			0.64
			Only with lactation		1.00	0.5 (0.2-1.2)	0.7 (0.3-1.7)			0.76
			history		1.00	0.5 (0.3-1.1)	0.6 (0.3-1.2)			0.83
		No significant risk increase was observed for each homologue (187, 74, 118, 138, 156, 170, 180, 183)								
Holford, 2000		Relative risk for each 10-ppm step of blood level								
Connecticut, U.S. Hospital-based 304/186 (the same subjects as in Zheng, 2000 mentioned above)	PCB 74				0.96 (0.90-1.03)					
	PCB118				1.00 (0.97-1.04)					
	PCB138				1.00 (0.97-1.02)					
	PCB153				0.98 (0.96-1.01)					
	PCB156				0.87 (0.78-0.99)					
	PCB170				0.99 (0.90-1.08)					
	PCB180				1.02 (0.99-1.05)					
	PCB183				1.23 (0.98-1.54)					
	PCB187				1.05 (0.96-1.15)					
	PCB Risk score (1)				1.00	1.45 (0.69-3.04)	1.71 (0.83-3.55)	1.61 (0.78-3.33)	3.57 (1.78-7.17)	
Wolff, 2000		Geometrical mean serum level (μ g/g fat)								
U.S. Hospital-based 175/355	DDE	0.61	0.66		1.00	0.80 (0.49-1.3)	0.93 (0.56-1.5)			0.499
	DDT	0.03	0.028		1.00	1.19 (0.73-2.0)	1.34 (0.82-2.2)			0.241
	DDT (not adjusted for fat)	0.2	0.19		1.00	1.7 (1.06-2.9)	1.7 (1.004-3.0)			0.233
	HPCB	0.6	0.62		1.00	0.88 (0.52-1.5)	0.78 (0.45-1.3)			0.22
	LPCB	0.11	0.11		1.00	1.47 (0.84-2.6)	0.96 (0.53-1.7)			0.758
	trans-nonachlor	0.035	0.036		1.00	0.99 (0.61-1.6)	0.73 (0.43-1.2)			0.354
Zheng, 2000		Mean concentration in fat tissue (ppb)								
	Oxychlorane	36.4	38	38	1.00	0.7 (0.4-1.2)	0.7 (0.4-1.2)	0.7 (0.4-1.3)		0.29
	trans-nonachlor	55.5	58.1	58.1	1.00	1.2 (0.7-2.1)	0.7 (0.4-1.3)	1.1 (0.6-1.9)		0.44
Romieu, 2000		Mean serum level (μ g/g fat)								
Mexico Parous women Population-based 120/126	Total									
	DDE	3.84	2.5	>0.05	1.00	1.24 (0.50-3.06)	2.31 (0.92-5.86)	3.81 (1.14-12.80)		0.02
	DDT	0.15	0.23	<0.05						
	Before menopause									
	DDE	2.4	1.93	>0.05	1.00	1.38 (0.46-4.17)	2.53 (0.75-8.49)	2.41 (0.37-15.81)		0.16
	DDT	0.22	0.13	<0.05						
After menopause										
DDE	5.1	3.12	>0.05	1.00	1.06 (0.15-7.27)	2.40 (0.44-12.98)	5.26 (0.80-34.30)		0.03	
DDT	0.25	0.18	<0.05							

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Charles MJ, 2001		Geometrical mean concentration in fat tissue adjusted for fat (ng/g lipid)								
U.S. Hospital-based, 1987-89 44/21	PCB49	0.5	1.0	N.S.						
	PCB52	2.9	2.0	N.S.						
	PCB70	3.7	2.7	N.S.						
	PCB101	4.6	3.8	N.S.						
	PCB105	17.7	19.6	N.S.						
	PCB110	3.2	2.9	N.S.						
	PCB118	55.1	46.5	N.S.						
	PCB137	8.0	8.0	N.S.						
	PCB138	94.8	84.7	N.S.						
	PCB153	129.2	110.7	N.S.						
	PCB156	2.2	17.6	N.S.						
	PCB169	0.6	0.7	N.S.						
	PCB170	27.3	22.5	N.S.						
	PCB177	7.5	6.7	N.S.						
	PCB180	77.6	65.1	N.S.						
	PCB183	13.8	10.7	N.S.						
	PCB187	29.4	24.7	N.S.						
	PCB189	1.9	1.8	N.S.						
	o,p'-DDE	1.4	0.5	0.0009						
	p,p'-DDE	1472.3	1387.7	N.S.						
	o,p'-DDT	15.9	10.4	N.S.						
	p,p'-DDT	102.0	77.8	N.S.						
Woolcott CG, 2001	ER negative	Geometrical mean concentration in fat tissue (μ g/kg)								
	PCB 28	Under detection limit for more than 30% of subjects			-					
	PCB 52	Under detection limit for more than 30% of subjects			-					
	PCB 99	21.9	17.7		1.00	0.9 (0.4-2.3)	2.1 (0.9-5.0)			
	PCB 101	Under detection limit for more than 30% of subjects			-					
	PCB 105	-	-		-					
	PCB 118	-	-		-					
	PCB 128	Under detection limit for more than 30% of subjects			-					
	PCB 138	81.8	66.8		-					
	PCB 153	114.6	98.3		1.00	1.0 (0.4-2.3)	1.7 (0.7-3.9)			
	PCB 156	20.1	17.2		1.00	3.9 (1.5-10.2)	2.5 (0.9-6.7)			
	PCB 170	36.1	32		1.00	1.4 (0.6-3.1)	1.5 (0.7-3.3)			
	PCB 180	75	65.7		-					
	PCB 183	11.8	9.5		-					
	PCB 187	27.1	24.2		-					
	p,p'-DDE	906	596		1.00	0.8 (0.3-2.1)	2.4 (1.0-5.4)			
	p,p'-DDT	23.5	19.3		-					
	cis-nonachlor	6.2	6		1.00	0.5 (0.2-1.1)	0.5 (0.2-1.2)			
	trans-nonachlor	43.3	41.1		1.00	1.0 (0.5-2.3)	1.1 (0.5-2.4)			
	oxychlordane	-	-		-					
	HCB	34.9	30.1		-					
	β -HCH	56.2	41.5		1.00	0.8 (0.3-1.9)	1.4 (0.6-3.2)			
	α -chlordane	Under detection limit for more than 30% of subjects			-					
	γ -chlordane	Under detection limit for more than 30% of subjects			-					

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
	Total PCB	1.02	0.87		1.00	1.1 (0.5-2.7)	1.7 (0.8-3.9)			
	ER positive									
	PCB 28	Under detection limit for more than 30% of subjects			-					
	PCB 52	Under detection limit for more than 30% of subjects			-					
	PCB 99	18.9	17.7		1.00	1.7 (0.9-3.2)	1.8 (0.9-3.6)			
	PCB 101	Under detection limit for more than 30% of subjects			-					
	PCB 105	-	-		-					
	PCB 118	-	-		-					
	PCB 128	Under detection limit for more than 30% of subjects			-					
	PCB 138	71.7	66.8		-					
	PCB 153	102.8	98.3		1.00	1.1 (0.6-2.0)	1.0 (0.5-1.8)			
	PCB 156	18.3	17.2		1.00	1.7 (0.9-3.1)	1.2 (0.6-2.2)			
	PCB 170	33.8	32		1.00	1.7 (1.0-3.0)	0.9 (0.5-1.6)			
	PCB 180	71.4	65.7		-					
	PCB 183	9.9	9.5		-					
	PCB 187	25.3	24.2		-					
	p,p'-DDE	638	596		1.00	0.9 (0.5-1.6)	1.1 (0.6-1.9)			
	p,p'-DDT	21.3	19.3		-					
	cis-nonachlor	5.9	6		1.00	0.9 (0.5-1.7)	0.7 (0.4-1.2)			
	trans-nonachlor	39.1	41.1		1.00	0.8 (0.5-1.4)	0.5 (0.3-0.9)			
	oxychlordane	-	-		-					
	HCB	31	30.1		-					
	β -HCH	39.3	41.5		1.00	0.8 (0.4-1.4)	0.7 (0.4-1.3)			
	α -chlordane	Under detection limit for more than 30% of subjects			-					
	γ -chlordane	Under detection limit for more than 30% of subjects			-					
	Total PCB	0.92	0.87		1.00	1.3 (0.8-2.4)	1.3 (0.7-2.3)			
Brophy JT, 2002										
Canada	With/without farm work experience				Adjusted for age and income					
Hospital-based	All ages				1.00		1.36 (0.74-2.51)			
1995-98	55 or younger				1.00		2.81 (0.94-8.40)			
299/237	56 or older				1.00		1.14 (0.57-2.28)			
					Adjusted for age and education					
	All ages				1.00		1.38 (0.67-2.83)			
	55 or younger				1.00		9.05 (1.06-77.43)			
	56 or older				1.00		0.88 (0.44-1.92)			
Charlier C, 2002										
		Mean serum level (ppb)			under 0.5 ppb	above 0.5 ppb				
Belgium	Total DDT	3.94	1.83	<0.0001	1.00	5.64 (1.81-17.65)				
Hospital-based	HCB	0.79	0.09	0.0005	1.00	9.14 (2.84-29.41)				
54.2/53.3 years of age on an average										
1999-2000										
159/250										
Demres A, 2002										
		Geometrical mean concentration in plasma lipid (μ g/kg)								
Canada	PCB 28	4.4	5.1							
Hospital- and	PCB 52	3.8	3.4							
population-based	PCB 99	10.8	9.6	0.02	1.00	1.20 (0.79-1.82)	1.27 (0.83-1.96)	1.33 (0.86-2.07)		
30-70 years of age	PCB 101	3.3	2.7							
1994-97	PCB 105	4.7	4.2							
314/523	PCB 118	17.7	15.7	0.03	1.00	0.90 (0.58-1.39)	1.12 (0.73-1.74)	1.60 (1.01-2.53)		

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					P trend
		Case	Control	P value	1	2	3	4	5	
	PCB 128									
	PCB 138	38.1	35.47	0.21	1.00	1.06 (0.69-1.62)	1.17 (0.76-1.80)	1.18 (0.75-1.85)		
	PCB 153	54.1	51	0.53	1.00	0.97 (0.63-1.50)	1.16 (0.75-1.79)	1.22 (0.78-1.92)		
	PCB 156	8.5	7.7	0.006	1.00	1.44 (0.91-2.26)	1.44 (0.90-2.31)	1.80 (1.11-2.94)		
	PCB 170	13.3	12.5	0.27	1.00	1.35 (0.86-2.12)	1.13 (0.71-1.82)	1.46 (0.90-2.37)		
	PCB 180	32.9	31.1	0.44	1.00	1.20 (0.76-1.90)	1.37 (0.86-2.19)	1.17 (0.70-1.93)		
	PCB 183	4.8	4.7	0.28	1.00	1.29 (0.82-2.01)	1.41 (0.89-2.24)	1.35 (0.84-2.16)		
	PCB 187	10.5	9.9	0.55	1.00	1.35 (0.87-2.09)	1.34 (0.85-2.12)	1.33 (0.83-2.13)		
	mono-ortho-PCBs congeners	6.4	5.8	0.005	1.00	1.63 (1.04-2.55)	1.45 (0.90-2.32)	2.02 (1.24-3.28)		
	Analysis was made by menopausal conditions; stronger correlation for premenopausal women									
Gammon MD, 2002		Geometrical mean serum level adjusted for fat (μ g/g)								
U.S.	DDE	671.96	645.74	0.52	1.00	0.88 (0.58-1.32)	0.94 (0.63-1.43)	0.92 (0.60-1.42)	1.20 (0.76-1.90)	
Population-based	DDT	68.98	69.32	0.89	1.00	0.69 (0.44-1.07)	1.04 (0.66-1.63)	1.16 (0.75-1.80)	1.15 (0.74-1.79)	
20 years or more of age	Peak-4PCBs	386.72	391.74	0.70	1.00	0.76 (0.51-1.15)	0.90 (0.60-1.35)	0.82 (0.54-1.24)	0.83 (0.54-1.29)	
1995-97	BZ118	55.13	56.47	0.59	1.00	0.96 (0.64-1.42)	0.77 (0.52-1.16)	0.82 (0.54-1.24)	0.93 (0.60-1.43)	
646/429	BZ138	82.08	84.92	0.56	1.00	1.26 (0.85-1.88)	1.04 (0.69-1.55)	0.80 (0.52-1.21)	0.96 (0.63-1.48)	
	BZ153	151.68	153.20	0.76	1.00	0.75 (0.50-1.13)	0.85 (0.57-1.27)	0.68 (0.45-1.03)	0.86 (0.56-1.32)	
	BZ180	79.66	78.63	0.70	1.00	0.87 (0.58-1.31)	0.81 (0.54-1.23)	0.89 (0.58-1.34)	0.95 (0.62-1.46)	
	Chlordane	94.58	95.90	0.77	1.00	0.88 (0.57-1.35)	0.97 (0.64-1.49)	1.20 (0.78-1.84)	0.98 (0.62-1.55)	
	Dieldrin	20.40	21.29	0.64	1.00	1.19 (0.59-2.41)	0.91 (0.45-1.84)	0.64 (0.30-1.35)	1.37 (0.69-2.72)	
Lopez-Carrillo L, 2002		Median serum level (ng/g) (ppb lipid weight = ng/g)								
Mexico	β -HCH	104.16	92.98	0.41	1.00	0.65 (0.28-1.51)	1.05 (0.46-2.40)			
Hospital-based	HCB	27.69	27.69	0.24	1.00	0.58 (0.24-1.39)	0.46 (0.20-1.07)			
20-79 years of age	PCBs	833	833	0.27	1.00	0.63 (0.23-1.76)	1.31 (0.33-5.21)			
1994-96										
95/95										
Mathur V, 2002										
India	α -HCH	0.609	0.156	<0.05						
Hospital-based	β -HCH	0.310	0.088	<0.05						
135/50	γ -HCH	0.466	0.080	<0.05						
No detail reported	Heptachlor	0.574	0.084	<0.05						
	Aldrin	1.997	0.115	<0.05						
	DDE	0.862	0.047	<0.05						
	DDD	0.569	0.249	<0.05						
	DDT	2.254	1.034	<0.05						
	Total HCH	1.468	0.325	<0.05						
	Total DDT	3.623	1.332	<0.05						
	Total pesticides	7.468	1.857	<0.05						
Pavuk M, 2003		Geometrical mean serum level (ng/g lipid)								
Eastern Slovakia	Group 1 PCBs (28, 52, 101)	37.2	59.8	0.004	1.00	0.34 (0.08-1.51)	0.22 (0.05-0.99)			0.02
Population-based	Group 2 PCBs (105, 114, 118, 123, 156, 157, 167, 189)	333.7	340.7	0.46	1.00	0.78 (0.18-3.29)	0.32 (0.07-1.56)			0.60
18-78 years of age	Group 3 PCBs (138, 153, 170, 180)	2829	2446.1	0.67	1.00	0.91 (0.22-3.73)	0.49 (0.12-2.04)			0.51
1997-99	Total PCBs	3228.2	2885.8	0.82	1.00	0.99 (0.25-4.00)	0.42 (0.10-1.82)			0.31
24/88	DDE	4912.1	3129.1	0.04	1.00	0.53 (0.08-3.27)	3.04 (0.65-14.3)			0.10
	DDT	163.8	107.6	0.03	1.00	0.33 (0.06-1.70)	1.19 (0.27-5.23)			0.68
	HCB	2158.3	1628.4	0.53	1.00	0.15 (0.02-1.05)	0.45 (0.06-3.19)			0.67

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category						
		Case	Control	P value	1	2	3	4	5	P trend	
Brody JG, 2004											
Persistent pesticides at application											
Relative exposure intensity											
Cape Cod Town, Massachusetts, U.S. Population-based 1988-95 1165/1006	Aerial application	cranberry bogs	No exposure	<0.001	0.001 to <0.01	0.01 to <0.1	>=0.1	P trend			
			1.00	0.8 (0.4-1.6)	1.2 (0.7-2.1)	1.4 (0.7-2.5)	1.8 (0.7-4.5)	0.69			
		tree pests	No exposure	<18	>=18	P trend					
			1.00	1.3 (0.8-2.0)	1.2 (0.7-1.8)	0.91					
	Ground application	other agriculture	No exposure	<0.001	0.001 to <0.01	0.01 to <0.1	>=0.1	P trend			
			1.00	0.9 (0.6-1.4)	0.6 (0.3-1.4)	0.5 (0.2-1.4)	0.8 (0.3-2.3)	0.50			
		mosquito control in wetlands	No exposure	<0.01	0.01 to <0.1	>=0.1	P trend				
			1.00	0.8 (0.4-1.6)	1.6 (0.7-3.7)	0.4 (0.1-1.5)	0.83				
	Residues from persistent pesticides										
	Aerial application	cranberry bogs	No exposure	<0.01	0.01 to <0.1	0.1 to <1	1 to <10	10 to <100	>=100	P trend	
			1.00	0.7 (0.4-1.2)	0.8 (0.5-1.2)	1.1 (0.7-1.6)	0.9 (0.5-1.7)	0.4 (0.1-1.2)	0.6 (0.2-2.5)	0.26	
	Ground application	other agriculture	No exposure	<0.001	0.001 to <0.01	0.01 to <0.1	0.1 to <1	1 to <10	10 to <100	>=100	P trend
1.00			0.9 (0.6-1.3)	1.0 (0.7-1.3)	1.1 (0.8-1.5)	1.0 (0.6-1.7)	0.5 (0.2-1.2)	0.7 (0.4-1.4)	0.8 (0.4-1.3)	0.55	
	mosquito control in wetlands	No exposure	<0.1	0.1 to <1	1 to <10	10 to <100	>=100	P trend			
		1.00	1.1 (0.7-1.9)	0.7 (0.5-1.2)	1.1 (0.4-3.0)	1.7 (0.6-5.5)	1.8 (0.5-6.8)	0.43			
Less persistent pesticides											
Aerial application	cranberry bogs	No exposure	<0.001	0.001 to <0.01	0.01 to <0.1	>=0.1	P trend				
		1.00	1.1 (0.6-2.0)	0.8 (0.5-1.3)	1.1 (0.6-1.8)	1.2 (0.6-2.8)	0.24				
	tree pests	No exposure	<1	>=1	P trend						
		1.00	1.7 (0.8-3.7)	1.6 (0.6-4.0)	0.26						
Ground application	other agriculture	No exposure	<0.001	0.001 to <0.01	>=0.01	P trend					
		1.00	1.5 (1.1-1.9)	1.8 (0.9-3.7)	0.9 (0.3-3.0)	0.63					
McCreedy D, 2004											
Geometrical median concentration in mammary gland tissue adjusted for fat (ng/g lipid)											
Canada Hospital-based 1995-97 70/69	PCB28	-	-	-	-						
	PCB52	-	-	-	-						
	PCB99	21.92	18.09	-	1.00	2.40 (0.95-6.04)					
	PCB101	-	-	-	-						
	PCB105	8.01	7.08	-	1.00	2.50 (1.02-6.13)					
	PCB118	34.64	22.13	-	1.00	1.71 (0.69-4.21)					
	PCB128	-	-	-	-						
	PCB138	84.9	71.07	-	1.00	1.07 (0.48-2.38)					
	PCB153	120.14	105.98	-	1.00	1.03 (0.44-2.38)					
	PCB156	20.15	18.75	-	1.00	1.17 (0.53-2.58)					
	PCB170	40.66	39.63	-	1.00	0.86 (0.38-1.91)					
	PCB180	85.43	74.31	-	1.00	0.77 (0.35-1.70)					
	PCB183	12.75	10.48	-	1.00	1.48 (0.65-3.33)					
	PCB187	31.31	27.02	-	1.00	1.09 (0.50-2.38)					
	Total PCB	1.07	0.92	-	1.00	1.06 (0.48-2.37)					
	p,p'-DDE	1241.75	616.13	-	1.00	2.48 (1.08-5.71)					
	p,p'-DDT	47.31	19.49	-	1.00	2.33 (0.97-5.61)					
	cis-nonachlor	8.01	6.42	-	1.00	1.04 (0.46-2.36)					
	trans-nonachlor	47.29	41.19	-	1.00	0.97 (0.44-2.18)					
	oxychlordane	35.09	31.08	-	1.00	0.99 (0.44-2.21)					
HCB	57.85	27.99	-	1.00	1.24 (0.53-2.90)						
Mirex	10.09	10.61	-	1.00	1.17 (0.54-2.55)						
β -HCH	116.9	46.55	-	1.00	0.85 (0.36-2.02)						
α -chlordane	-	-	-	-							
γ -chlordane	-	-	-	-							

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
	GSTM1									
	Wild-type/heterozygous			1.00						
	Null deletion			2.20 (1.09-4.42)						
	GSTT1									
	Wild-type/heterozygous			1.00						
	Null deletion			1.59 (0.63-4.04)						
	CYP1A1-M2									
	Wild-type			1.00						
	Variant			0.26 (0.07-1.01)						
	CYP1A1-M4									
	Wild-type			1.00						
	Heterozygous			0.64 (0.17-2.36)						
	CYP1A1-M1									
	Wild-type			1.00						
	Variant			0.65 (0.27-1.59)						
	CYP1A2									
	Wild-type			1.00						
	Heterozygous			0.66 (0.11-4.06)						
	CYP3A4									
	Wild-type			1.00						
	Variant heterozygous			0.74 (0.26-2.11)						
	oxychlordane	GSTM1								
		Wild-type/heterozygous		1.00		0.38 (0.11-1.33)				0.03
		Null deletion		1.00		2.30 (0.75-7.01)				(P for interaction)
	HCB	GSTM1								
		Wild-type/heterozygous		1.00		0.46 (0.13-1.58)				0.03
		Null deletion		1.00		2.85 (0.89-9.06)				(P for interaction)
	β -HCH	GSTM1								
		Wild-type/heterozygous		1.00		0.21 (0.05-0.91)				0.04
		Null deletion		1.00		1.35 (0.42-4.40)				(P for interaction)
	PCB180	CYP1A1-M1								
		Wild-type		1.00		1.05 (0.43-2.59)				0.03
		Variant		1.00		0.06 (0.01-0.67)				(P for interaction)
	PCB187	CYP1A1-M1								
		Wild-type		1.00		1.75 (0.73-4.22)				0.01
		Variant		1.00		0.12 (0.02-0.81)				(P for interaction)
Charlier C, 2004		Mean serum level (μ g/g lipid)		<0.5ppb		>0.5ppb				
Belgium	p,p'-DDE	0.58	0.31	<0.0001	1.00	2.21 (1.41-3.48)				
Hospital-based	p,p'-DDT	0.02	0.02	NS	-	-				
2001-02	o,p'-DDE	-	-	-	-	-				
231/290	o,p'-DDT	-	-	-	-	-				
	HCB	0.11	0.03	<0.0001	1.00	4.99 (2.95-8.43)				
Mckelvey W, 2004	Living period in Cape Cod Town after 1948									
Cape Cod Town, Massachusetts, U.S.					1/2 to less than 5 years	1.00				
Population-based					5 to less than 10 years	1.18 (0.87-1.61)				
1988-95					10 to less than 15 years	1.28 (0.93-1.77)				
1165/1006					15 to less than 20 years	1.18 (0.85-1.64)				
					20 to less than 25 years	1.57 (1.11-2.23)				
					25 to less than 30 years	1.72 (1.12-2.64)				
					30 to less than 35 years	1.11 (0.69-1.79)				
					35 to less than 40 years	1.33 (0.80-2.22)				
					40 to 47 years	1.54 (1.07-2.22)				

Region and number of subjects (case/control)	Compound	Comparison of serum levels		P value	Odds ratio by category					P trend	
		Case	Control		1	2	3	4	5		
McElroy JA, 2004											
Wisconsin, U.S. Population-based 1998-2000 1481/1301	Recent consumption of sport-caught fish			No 1.00		Yes 1.00 (0.86-1.17)					
	Amount consumed of sport-caught fish (meals/year)			No 1.00		1-3 meals/year 1.05 (0.85-1.30)	4-23 1.01 (0.82-1.26)	24 or more 0.94 (0.75-1.18)		0.38	
	Recent consumption of fish from Great Lakes			No 1.00		Yes 1.06 (0.84-1.339)					
	Recent consumption of salmon or trout from Great Lakes			No 1.00		Yes 1.00 (0.78-1.28)					
	Amount consumed of salmon or trout from Great Lakes (meals/year)			No 1.00		1-2 meals/year 1.19 (0.85-1.66)	3-6 0.71 (0.44-1.15)	7 or more 0.98 (0.62-1.54)		0.92	
	Before menopause										
	Recent consumption of sport-caught fish			No 1.00		Yes 1.24 (0.96-1.59)					
	Recent consumption of fish from Great Lakes			No 1.00		Yes 1.70 (1.16-2.50)					
	After menopause										
	Recent consumption of sport-caught fish			No 1.00		Yes 0.91 (0.74-1.11)					
	Recent consumption of fish from Great Lakes			No 1.00		Yes 0.78 (0.57-1.07)					

1) Sum of (level of each homologue x regression coefficient for each risk)

Table 2.1.4: Case-control studies on relationship of endocrine disruptors with breast cancer (pooled analysis)

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Laden, 2001										
North America	PCBs				1.00	0.91 (0.71-1.15)	0.81 (0.63-1.04)	0.88 (0.69-1.14)	0.94 (0.73-1.21)	0.26
Whites	DDE				1.00	1.09 (0.86-1.39)	0.83 (0.62-1.11)	0.95 (0.75-1.21)	0.99 (0.77-1.27)	0.42
Pooled analysis of five studies (Western NY, NHS, CLUE 1, Mount Sinai, Yale) 1400/1642 Western NY (retrospective): 154/191 (Moysich 1988) Nurse's Health Study (nested case-control): 372/372 (Hunter 1997, Laden 2001) CLUE 1 (nested case-control): 235/235 (Helzlsouer 1999) Mount Sinai (retrospective): 164/342 (Wolff 2000) Yale (retrospective): 475/502 (Zheng 2000)										
					Minimum vs. maximum concentration in blood or tissue					
Meta-analysis of 22 studies	p,p'-DDE			All studies	0.97 (0.87-1.09)					
Prospective studies				Prospective	0.91 (0.74-1.12)					
Wolff et al. 1993: 58/171				Population-based case-control	1.11 (0.89-1.38)					
Krieger et al. 1994: 150/150				Hospital-based case-control	0.93 (0.77-1.12)					
Hunter et al. 1997: 236/236										
Hoyer et al. 1998: 237/469										
Helzlsouer et al. 1999: 235/235 (CLUE1), 105/105 (CLUE2)										
Dorgan et al. 1999: 105/207										
Hoyer et al. 2000: 240/477										
Wolff et al. 2000: 110/213										
Laden et al. 2001: 381/381										
Population-based case-control studies										
van't Veer et al. 1997: 265/341										
Moysich et al. 1998: 154/192										
Dello Iacovo et al. 1999: 170/190										
Romieu et al. 2000: 120/126										
Demers et al. 2000: 315/307 (overlapping with hospital-based study)										
Millikan et al. 2000: 456/389										
Hospital-based case-control studies										
Lopez-Carrillo et al. 1997: 139/139										
Mendonca et al. 1999: 177/350										
Zheng et al. 1999: 304/186										
Zheng et al. 2000: 326/347										
Wolff et al. 2000: 175/181/175										
Aronson et al. 2000: 217/213										
Demers et al. 2000: 315/219 (overlapping with population-based study)										
Stellman et al. 2000: 232/323										

Table 2.1.5: Synchronic studies on relationship of endocrine disruptors with breast cancer

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category				
		Case	Control	P value	1	2	3	4	P trend
Unger, 1984									
Average concentration in mammary fat tissue (ppm)									
Denmark 32 (14 biopsied, 18 autopsied)/35 (21 biopsied, 14 autopsied)	Autopsy data	PCB 6.47 (n=18)	5.12 (n=35)	No significant difference	1.00	≥ 0.1 mg/kg fat	10.51 (2.00-55.26)		
		DDT no estimation	1.97 (n=35)						
	Biopsy data	PCB 3.89 (n=14)	3.93 (n=21)						
		DDT 1.23 (n=14)	1.25 (n=21)						
Mussalo-Rauhamaa, 1990									
Average concentration in mammary tissue (ppm)									
Finland Patients who underwent surgery, accidental deaths as control 44/33	pp'-DDT	29	20	0.57	1.00	≥ 0.1 mg/kg fat	10.51 (2.00-55.26)		
	op'-DDD	9	9	0.40					
	pp'-DDE	41	33	0.87					
	PCB	41	33	0.17					
	HCB:	41	33	0.48					
	Beta-HCH	24	16	0.03					
	Hepatoclor epoxide	12	12	0.63					
Falck, 1992									
Average level in fat tissue (range) (ng/g wet weight)									
Connecticut, U.S. Whites, 1987 Of 50 subjects showing abnormalities in mammography, breast cancer 23/benign 27	HCB	28 (16-61)	26 (14-60)	0.54					
	Heptachlorepoixide+qxychlorane	136 (66-243)	121 (33-278)	0.36					
	trans-nonachlor	103 (38-197)	118 (53-439)	0.49					
	DDE	2200 (425-6398)	1487 (308-3674)	0.07					
	DDT	216 (72-881)	148 (42-405)	0.12					
	PCBs	1965 (827-4562)	1395 (823-2875)	0.54					
	ng/g fat								
	HCB	28 (16-61)	26 (14-60)	0.54					
	Heptachlorepoixide+qxychlorane	136 (66-243)	121 (33-278)	0.36					
	trans-nonachlor	103 (38-197)	118 (53-439)	0.49					
	DDE	2200 (425-6398)	1487 (308-3674)	0.07					
	DDT	216 (72-881)	148 (42-405)	0.12					
	PCBs	1965 (827-4562)	1395 (823-2875)	0.54					
					1.001 (P<0.05)				
					1.002 (P<0.05)				
Guttes, 1998									
	beta-HCH	79	93	0.36					
	HCB	309	261	0.404					
	p,p'-DDE	805	496	0.017					
	p,p'-DDT	30	28	0.714					
	PCB118	81	65	0.042					
	PCB138	228	194	0.185					
	PCB153	624	505	0.083					
	PCB156	61	76	0.206					
	PCB170	245	267	0.634					
	PCB180	375	301	0.103					
	Lucena RA, 2001								
Average level in mammary tissue									
Reina Sofia University Hospital, Spain Patients whose mammary tissue was removed 51.3 years of age on an average Patients of benign diseases as control 1997 65/69	PCB28				9.597 (p=0.0001)				
	PCB52				PCB28 以外は関連なく、値の記載なし。				
	PCB101								
	PCB118								
	PCB138								
	PCB153								
PCB170									

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	P trend	
Ahmed MT, 2002 Egypt The Health Insurance Outpatient Clinic 45 years of age on an average 1999-2000 43/21/11	PCB180 PCB183 PCB187 PCB188	Residue in serum (ng/g)	Benign breast disease patients	Control	P value					
	p, p'-DDE PCBs	Breast cancer patients 41 54.9	48 59.2	31 61.9	0.03 N.S.					

Table 2.1.6: Ecological studies on relationship of endocrine disruptors with breast cancer

Region and number of subjects (case/control)	Compound	Comparison of serum levels		P value	Odds ratio by category				P trend
		Case	Control		1(Low)	2	3	4(High)	
Grimalt, 1994									
Catalonia, Spain 5003 Residents (2531 men) near a organochlorine manufacturing plant 1980-89 Atmospheric HCB about 100 times higher than control area	HCB	Average blood PCB level (non-random sample) Exposed area Control area			SIR (95% CI) 1.3 (0.84-2.1)				
Kettles, 1997									
120 Counties in Kentucky, U.S. 3.7 Million of population (92% whites) Data from 1991-92 and 1993-94 Ecological study	Triazine	Summary index calculated from concentration in groundwater and surface water, wheat yield and pesticide use as exposure indicator				Medium	high		
	1991-1992 年			1.00	1.09 (1.04-1.14)	1.07 (1.01-1.14)			
	1993-1994 年			1.00	1.14 (1.08-1.19)	1.20 (1.13-1.28)			
Schreinemacher, 2000									
U.S. Whites 152 Counties in Minnesota, North Dakota, South Dakota and Montana producing spring wheat and durum wheat treated with chlorophenoxy herbicides 1980-89 Ecological study	Chlorophenoxy herbicides				SRR (95% CI) for counties with acreage: 23,000-110,999 acres;0.98(0.90-1.08) ≥ 111,000 acres ;0.98(0.89-1.08)				
Janssens JP, 2001									
589 Communities in Belgium Relative acreage in 1998 Pesticide use per unit acreage in 1997-98 Breast cancer mortality in 1985-94 Ecological study	Relative acreage in 1998: potato Pesticide use per unit acreage in 1997-98: defoliant			<0.0001 <0.0001					
Koifman S, 2002									
11 States of Brazil Pesticide sales in 1985 Breast cancer mortality in 1995-97 Ecological study	Pesticide sales in 1985				29-39 years of age 40-49 years of age 50-69 years of age All ages	Correlation factor 0.39 0.66 0.81 0.80			
Hopenhayn-Rich C, 2002									
120 Counties in Kentucky, U.S. 3.7 Million population Exposure to atrazine Breast cancer prevalence in 1993-97 Ecological study	atrazine	Exposure level estimated from tap water concentration, corn acreage and atrazine sales			Exposure score 0-3 1.00	3-4 1.03 (0.96-1.11)	4-6 0.97 (0.92-1.02)	6-9 0.98 (0.93-1.04)	

Table 2.1.7: Case-only study on relationship of endocrine disruptors with breast cancer

Region and number of subjects (case/control)	Compound	Comparison of serum levels			Odds ratio by category					
		Case	Control	P value	1	2	3	4	5	P trend
Saint M, 2004										
France 1998-2001 282 Cases	Period of living around a waste incinerator				Unexposed 1.00*	Less than 10 years 1.72 (0.45-6.65)	10 Years or more 3.26 (1.20-8.84)			
	Period of exposure to pesticides				Unexposed 1.00*	Less than 20 years 1.25 (0.60-2.61)	20 Years or more 2.18 (1.10-4.32)			
Study of interactions with CYP1B1 gene polymorphism (Leu/Leu vs. Anv Val)					*Unexposed subjects with Leu/Leu alleles					