

Supplementary Materials: A Preliminary Link between Hydroxylated Metabolites of Polychlorinated Biphenyls and Free Thyroxin in Humans

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Table S1. PCB levels in serum ($n = 180$).

	Wet Weight Basis (ng/L)		Lipid Weight Basis (ng/g Lipid)	
PCB28	1	0–174	0.2	0–111
PCB52	0	0–20	0	0–20
PCB74	18	2–353	2.9	0.3–122
PCB95	1	1–14	0.2	0.1–5
PCB99	22	2–121	0.2	0.1–5
PCB101	1	0–17	0.2	0.1–6
PCB105	7	2–102	1.1	0.3–18
PCB118	41	4–448	6.9	0.7–165
PCB149	5	1–39	0.7	0.2–39
PCB146	26	2–163	4.2	0.3–65
PCB153	259	16–1262	43.1	2.5–624
PCB138	135	2–703	22.5	0.3–317
PCB187	37	2–327	6.2	0.4–95
PCB183	17	2–327	2.8	0.3–69
PCB128	0	0–42	0.1	0–42
PCB167	22	2–161	3.7	0.3–66
PCB174	2	0–9	0.4	0.0–7
PCB177	11	2–64	1.8	0.2–26
PCB171	6	2–33	1.0	0.2–17
PCB172	6	2–51	1.0	0.2–18
PCB156	23	2–217	3.8	0.3–71
PCB180	175	10–1136	27	1.6–432
PCB170	69	4–436	10.5	0.7–167
PCB199	9	2–85	1.4	0.2–26
PCB196/203	15	2–82	2.3	0.2–40
PCB194	14	2–111	2.3	0.2–43
PBC206	2	1–14	0.4	0.1–7.0
PCB209	1	1–10	0.2	0.1–6.0

Results are expressed as median (minimum–maximum).

Table S2. PCB metabolite levels in serum ($n = 180$).

	Median	Range (min–max)
4-HO-PCB79	0.0	(0.0–52)
4-HO-PCB120	1.0	(0.3–5)
3-HO-PCB118	5.0	(0.9–49)
4-HO-PCB107	9.0	(1.0–77)
3-HO-PCB153	3.0	(0.7–23)
4-HO-PCB146	15.0	(1.0–131)
4-HO-PCB127	1.0	(0.3–11)
3-HO-PCB138	6.0	(0.8–51)
4-HO-PCB130	0.0	(0.0–2)
4-HO-PCB163	2.0	(0.7–12)
4-HO-PCB187	16.0	(1.0–81)
4-HO-PCB162	3.0	(0.9–17)
4-HO-PCB177	0.0	(0.0–3)
3-HO-PCB180	2.0	(0.6–19)
4-HO-PCB172	4.0	(0.8–29)
4-HO-PCB193	0.0	(0.0–4)
4-diHO-PCB202	0.0	(0.0–4)
4-HO-PCB208	0.0	(0.0–5)

Results are expressed in ng/L and represented as median (minimum–maximum).

Table S3. Linear regression for FT4 with lipid adjusted PCBs.

Linear Regression Model				
POP	Significance	R ²	β (95% CI)	P
PCB28	0.096	0.052		
			Gender	−0.027 (−0.118–0.063)
			Age	−0.001 (−0.005–0.002)
			BMI	0.006 (0.002–0.011)
			Smoking status	0.053 (−0.061–0.168)
			PCB28	0.038 (−0.093–0.168)
PCB52	0.094	0.053		
			Gender	−0.030 (−0.121–0.061)
			Age	−0.001 (−0.004–0.002)
			BMI	0.006 (0.002–0.011)
			Smoking status	0.047 (−0.066–0.161)
			PCB52	−0.083 (−0.340–0.174)
PCB74	0.068	0.057		
			Gender	−0.038 (−0.114–0.068)
			Age	−0.116 (−0.007–0.002)
			BMI	0.193 (0.001–0.011)
			Smoking status	0.069 (−0.060–0.166)
			PCB74	0.107 (−0.060–0.218)

Table S3. Cont.

Linear Regression Model					
POP	Significance	R ²	β (95% CI)	P	
PCB95	0.024	0.072			
			Gender	−0.024 (−0.113–0.066)	0.604
			Age	−0.001 (−0.004–0.003)	0.754
			BMI	0.007 (0.002–0.012)	0.004
			Smoking status	0.041 (−0.071–0.154)	0.470
			PCB95	−0.299 (−0.595–0.002)	0.048
PCB99	0.024	0.071			
			Gender	−0.026 (−0.116–0.064)	0.566
			Age	−0.003 (−0.007–0.001)	0.108
			BMI	0.006 (0.001–0.011)	0.012
			Smoking status	0.046 (−0.066–0.158)	0.421
			PCB99	0.143 (0.000–0.285)	0.049
PCB101	0.017	0.076			
			Gender	−0.014 (−0.104–0.077)	0.768
			Age	−0.001 (−0.004–0.003)	0.676
			BMI	0.006 (0.002–0.011)	0.009
			Smoking status	0.037 (−0.075–0.150)	0.516
			PCB101	−0.317 (−0.601–0.033)	0.029
PCB105	0.109	0.050			
			Gender	−0.028 (−0.119–0.063)	0.547
			Age	−0.001 (−0.005–0.003)	0.599
			BMI	0.006 (0.002–0.011)	0.008
			Smoking status	0.049 (−0.065–0.164)	0.396
			PCB105	0.002 (−0.204–0.208)	0.986
PCB118	0.105	0.050			
			Gender	−0.028 (−0.119–0.063)	0.547
			Age	−0.001 (−0.005–0.003)	0.599
			BMI	0.006 (0.002–0.011)	0.008
			Smoking status	0.049 (−0.065–0.164)	0.396
			PCB118	0.002 (−0.204–0.208)	0.986
PCB149	0.017	0.076			
			Gender	−0.030 (−0.121–0.062)	0.586
			Age	−0.001 (−0.005–0.004)	0.720
			BMI	0.006 (0.002–0.011)	0.009
			Smoking status	0.046 (−0.069–0.161)	0.505
			PCB149	−0.248 (−0.471–0.025)	0.030

Table S3. Cont.

Linear Regression Model					
POP	Significance	R ²	β (95% CI)	P	
PCB146	0.109	0.050			
			Gender	−0.028 (−0.119–0.063)	0.542
			Age	−0.001 (−0.006–0.004)	0.653
			BMI	0.006 (0.002–0.011)	0.011
			Smoking status	0.050 (−0.064–0.163)	0.391
			PCB146	0.005 (−0.172–0.181)	0.958
PCB153	0.101	0.051			
			Gender	−0.028 (−0.118–0.063)	0.547
			Age	0.000 (−0.005–0.005)	0.948
			BMI	0.006 (0.001–0.011)	0.015
			Smoking status	0.048 (−0.066–0.162)	0.406
			PCB153	−0.034 (−0.186–0.118)	0.660
PCB138	0.089	0.053			
			Gender	−0.027 (−0.118–0.063)	0.550
			Age	0.000 (−0.004–0.005)	0.960
			BMI	0.006 (0.002–0.011)	0.009
			Smoking status	0.048 (−0.065–0.162)	0.401
			PCB138	−0.053 (−0.196–0.090)	0.468
PCB187	0.108	0.050			
			Gender	−0.028 (−0.119–0.063)	0.540
			Age	−0.001 (−0.006–0.004)	0.612
			BMI	0.007 (0.002–0.012)	0.010
			Smoking status	0.050 (−0.064–0.163)	0.389
			PCB187	0.011 (−0.153–0.176)	0.892
PCB183	0.109	0.050			
			Gender	−0.028 (−0.119–0.063)	0.544
			Age	−0.001 (−0.006–0.003)	0.638
			BMI	0.006 (0.002–0.011)	0.008
			Smoking status	0.049 (−0.064–0.163)	0.392
			PCB183	0.003 (−0.183–0.188)	0.975
PCB128	0.105	0.051			
			Gender	−0.028 (−0.118–0.063)	0.548
			Age	−0.001 (−0.004–0.002)	0.578
			BMI	0.006 (0.002–0.011)	0.008
			Smoking status	0.048 (−0.067–0.162)	0.412
			PCB128	−0.040 (−0.292–0.212)	0.754

Table S3. Cont.

Linear Regression Model					
POP	Significance	R ²	β (95% CI)	P	
PCB167	0.104	0.051			
			Gender	−0.029 (−0.120–0.062)	0.526
			Age	0.000 (−0.005–0.004)	0.861
			BMI	0.006 (0.001–0.011)	0.016
			Smoking status	0.046 (−0.069–0.161)	0.434
			PCB167	−0.031 (−0.208–0.147)	0.733
PCB174	0.067	0.057			
			Gender	−0.026 (−0.116–0.064)	0.571
			Age	−0.001 (−0.004–0.002)	0.535
			BMI	0.006 (0.001–0.011)	0.015
			Smoking status	0.042 (−0.071–0.156)	0.463
			PCB174	−0.224 (−0.614–0.167)	0.260
PCB177	0.108	0.050			
			Gender	−0.028 (−0.119–0.062)	0.539
			Age	−0.001 (−0.006–0.003)	0.571
			BMI	0.007 (0.002–0.011)	0.008
			Smoking status	0.050 (−0.064–0.164)	0.388
			PCB177	0.016 (−0.182–0.213)	0.874
PCB171	0.103	0.051			
			Gender	−0.028 (−0.019–0.062)	0.540
			Age	−0.002 (−0.006–0.003)	0.484
			BMI	0.007 (0.002–0.011)	0.007
			Smoking status	0.051 (−0.063–0.165)	0.375
			PCB171	0.047 (−0.203–0.298)	0.711
PCB172	0.102	0.051			
			Gender	−0.029 (−0.120–0.062)	0.532
			Age	−0.002 (−0.006–0.003)	0.459
			BMI	0.007 (0.002–0.012)	0.008
			Smoking status	0.052 (−0.062–0.167)	0.368
			PCB172	0.051 (−0.180–0.182)	0.664
PCB156	0.109	0.050			
			Gender	−0.028 (−0.119–0.063)	0.541
			Age	−0.001 (−0.006–0.004)	0.645
			BMI	0.007 (0.001–0.012)	0.012
			Smoking status	0.050 (−0.064–0.164)	0.389
			PCB156	0.009 (−0.177–0.195)	0.926

Table S3. Cont.

Linear Regression Model				
POP	Significance	R ²	β (95% CI)	P
PCB180	0.106	0.051		
			Gender	−0.027 (−0.118–0.063) 0.552
			Age	0.000 (−0.006–0.005) 0.868
			BMI	0.006 (0.001–0.011) 0.020
			Smoking status	0.048 (−0.066–0.162) 0.406
			PCB180	−0.021 (−0.174–0.132) 0.785
PCB170	0.107	0.050		
			Gender	−0.028 (−0.118–0.063) 0.549
			Age	−0.001 (−0.006–0.005) 0.812
			BMI	0.006 (0.001–0.011) 0.016
			Smoking status	0.048 (−0.065–0.162) 0.402
			PCB170	−0.016 (−0.182–0.151) 0.851
PCB199	0.092	0.053		
			Gender	−0.029 (−0.120–0.062) 0.528
			Age	−0.002 (−0.007–0.002) 0.366
			BMI	0.007 (0.002–0.012) 0.006
			Smoking status	0.054 (−0.060–0.168) 0.351
			PCB199	0.071 (−0.134–0.275) 0.497
PCB196/203	0.107	0.051		
			Gender	−0.028 (−0.119–0.062) 0.539
			Age	−0.001 (−0.006–0.003) 0.580
			BMI	0.007 (0.002–0.012) 0.011
			Smoking status	0.051 (−0.064–0.165) 0.384
			PCB196/203	0.019 (−0.179–0.218) 0.847
PCB194	0.108	0.050		
			Gender	−0.028 (−0.119–0.063) 0.539
			Age	−0.001 (−0.006–0.004) 0.628
			BMI	0.007 (0.001–0.012) 0.014
			Smoking status	0.050 (−0.064–0.164) 0.389
			PCB194	0.010 (−0.187–0.208) 0.917
PCB206	0.106	0.051		
			Gender	−0.028 (−0.119–0.062) 0.538
			Age	−0.001 (−0.005–0.003) 0.509
			BMI	0.007 (0.002–0.011) 0.008
			Smoking status	0.052 (−0.063–0.167) 0.374
			PCB206	0.042 (−0.260–0.345) 0.785

Table S3. Cont.

Linear Regression Model					
POP	Significance	R ²	β (95% CI)	P	
PCB209	0.107	0.051			
			Gender	−0.028 (−0.119–0.062)	0.538
			Age	−0.001 (−0.005–0.002)	0.524
			BMI	0.007 (0.002–0.011)	0.008
			Smoking status	0.051 (−0.064–0.165)	0.381
			PCB209	0.040 (−0.322–0.401)	0.829
SumPCB	0.107	0.051			
			Gender	−0.028 (−0.119–0.063)	0.545
			Age	−0.001 (−0.006–0.004)	0.805
			BMI	0.006 (0.001–0.011)	0.012
			Smoking status	0.048 (−0.065–0.162)	0.402
			SumPCB	−0.016 (−0.163–0.131)	0.829

The model included gender, age, BMI, current smoking behavior, and one serum PCB level (lipid adjusted); FT4 was used as a square root transformed variable; All PCB levels were used after log transformation.

Table S4. Linear regression for FT4 with hydroxylated PCB metabolites and total lipids.

Linear Regression Model					
POP	Significance	R ²	β (95% CI)	P	
4HO-PCB79	0.023	0.082			
			Gender	−0.030 (−0.120–0.061)	0.519
			Age	0.001 (−0.003–0.004)	0.766
			BMI	0.008 (0.003–0.013)	0.002
			Smoke	0.077 (−0.039–0.193)	0.192
			Total lipids	0.000 (−0.001–0.000)	0.019
			4HO-PCB79	−0.028 (−0.135–0.078)	0.602
4HO-PCB120	0.022	0.083			
			Gender	−0.030 (−0.121–0.060)	0.507
			Age	0.001 (−0.003–0.005)	0.634
			BMI	0.007 (0.003–0.012)	0.002
			Smoke	0.072 (−0.042–0.186)	0.216
			Total lipids	0.000 (−0.001–0.000)	0.018
			4HO-PCB120	−0.121 (−0.507–0.266)	0.539
3HO-PCB118	0.002	0.112			
			Gender	−0.024 (−0.113–0.065)	0.592
			Age	0.001 (−0.002–0.005)	0.442
			BMI	0.005 (0.000–0.010)	0.061
			Smoke	0.060 (−0.053–0.173)	0.293
			Total lipids	0.000 (−0.001–0.000)	0.024
			3HO-PCB118	−0.147 (−0.267–0.028)	0.016

Table S4. Cont.

Linear Regression Model				
POP	Significance	R ²	β (95% CI)	P
4HO-PCB107	0.021	0.083		
			Gender	−0.029 (−0.120–0.061)
			Age	0.000 (−0.005–0.004)
			BMI	0.008 (0.003–0.013)
			Smoke	0.065 (−0.051–0.181)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB107	0.060 (−0.109–0.229)
3HO-PCB153	0.017	0.086		
			Gender	−0.026 (−0.117–0.064)
			Age	−0.001 (−0.006–0.004)
			BMI	0.009 (0.003–0.015)
			Smoke	0.074 (−0.041–0.188)
			Total lipids	0.000 (−0.001–0.000)
			3HO-PCB153	0.0120 (−0.115–0.355)
4HO-PCB146	0.015	0.088		
			Gender	−0.030 (−0.120–0.060)
			Age	−0.002 (−0.007–0.004)
			BMI	0.009 (0.004–0.015)
			Smoke	0.072 (−0.042–0.186)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB146	0.118 (−0.086–0.323)
4HO-PCB127	0.025	0.081		
			Gender	−0.031 (−0.121–0.060)
			Age	0.001 (−0.003–0.004)
			BMI	0.007 (0.002–0.012)
			Smoke	0.072 (−0.042–0.187)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB127	−0.040 (−0.333–0.253)
3HO-PCB138	0.016	0.087		
			Gender	−0.025 (−0.116–0.065)
			Age	−0.001 (−0.007–0.004)
			BMI	0.009 (0.004–0.014)
			Smoke	0.074 (−0.041–0.188)
			Total lipids	0.000 (−0.001–0.000)
			3HO-PCB138	0.106 (−0.089–0.302)

Table S4. Cont.

Linear Regression Model				
POP	Significance	R ²	β (95% CI)	P
4HO-PCB130	0.025	0.081		
			Gender	−0.030 (−0.120–0.061)
			Age	0.000 (−0.003–0.004)
			BMI	0.008 (0.003–0.012)
			Smoke	0.072 (−0.042–0.187)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB130	0.044 (−0.493–0.581)
4HO-PCB163	0.014	0.089		
			Gender	−0.032 (−0.122–0.058)
			Age	−0.002 (−0.006–0.003)
			BMI	0.009 (0.004–0.014)
			Smoke	0.072 (−0.042–0.186)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB163	0.184 (−0.109–0.478)
4HO-PCB187	0.023	0.082		
			Gender	−0.032 (−0.123–0.059)
			Age	0.000 (−0.004–0.004)
			BMI	0.008 (0.003–0.014)
			Smoke	0.073 (−0.042–0.187)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB187	0.057 (−0.159–0.272)
4HO-PCB162	0.024	0.082		
			Gender	−0.031 (−0.121–0.059)
			Age	0.000 (−0.005–0.004)
			BMI	0.008 (0.003–0.013)
			Smoke	0.067 (−0.050–0.184)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB162	0.056 (−0.199–0.312)
4HO-PCB177	0.022	0.083		
			Gender	−0.029 (−0.119–0.061)
			Age	0.000 (−0.004–0.004)
			BMI	0.008 (0.003–0.013)
			Smoke	0.073 (−0.041–0.188)
			Total lipids	0.000 (−0.001–0.000)
			4HO-PCB177	0.091 (−0.199–0.381)

Table S4. Cont.

Linear Regression Model				
POP	Significance	R ²	β (95% CI)	P
3HO-PCB180	0.003	0.110		
			Gender	−0.041 (−0.130–0.049) 0.381
			Age	−0.002 (−0.007–0.002) 0.257
			BMI	0.010 (0.005–0.015) 0.000
			Smoke	0.083 (−0.030–0.196) 0.148
			Total lipids	0.000 (−0.001–0.000) 0.020
			3HO-PCB180	0.287 (0.047–0.527) 0.020
4HO-PCB172	0.010	0.094		
			Gender	−0.037 (−0.127–0.053) 0.420
			Age	−0.003 (−0.008–0.003) 0.334
			BMI	0.010 (0.004–0.016) 0.001
			Smoke	0.073 (−0.040–0.187) 0.205
			Total lipids	0.000 (−0.001–0.000) 0.024
			4HO-PCB172	0.203 (−0.051–0.457) 0.116
4HO-PCB193	0.002	0.112		
			Gender	−0.034 (−0.123–0.055) 0.447
			Age	−0.001 (−0.005–0.003) 0.541
			BMI	0.009 (0.004–0.014) 0.000
			Smoke	0.071 (−0.042–0.184) 0.215
			Total lipids	0.000 (−0.001–0.000) 0.025
			4HO-PCB193	0.365 (0.071–0.658) 0.015
4diMeO-PCB202	0.025	0.081		
			Gender	−0.030 (−0.120–0.061) 0.517
			Age	0.001 (−0.003–0.004) 0.796
			BMI	0.008 (0.003–0.004) 0.002
			Smoke	0.072 (−0.043–0.187) 0.217
			Total lipids	0.000 (−0.001–0.000) 0.019
			4diMeO-PCB202	−0.007 (−0.330–0.315) 0.964
4HO-PCB208	0.020	0.084		
			Gender	−0.029 (−0.120–0.061) 0.521
			Age	0.000 (−0.003–0.004) 0.882
			BMI	0.008 (0.003–0.013) 0.002
			Smoke	0.073 (−0.042–0.187) 0.211
			Total lipids	0.000 (−0.001–0.000) 0.018
			4HO-PCB208	0.121 (−0.169–0.410) 0.412

Table S4. Cont.

Linear Regression Model				
POP	Significance	R ²	β (95% CI)	P
sum HO-PCBs	0.020	0.084		
			Gender	−0.031 (−0.121–0.059)
			Age	−0.001 (−0.006–0.004)
			BMI	0.009 (0.003–0.014)
			Smoke	0.070 (−0.045–0.184)
			Total lipids	0.000 (−0.001–0.000)
			Sum HO-PCBs	0.091 (−0.148–0.329)



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