Profiling of polychlorinated biphenyls in Chinese tea: National distribution, Variety-specific variations, and the Impact of processing

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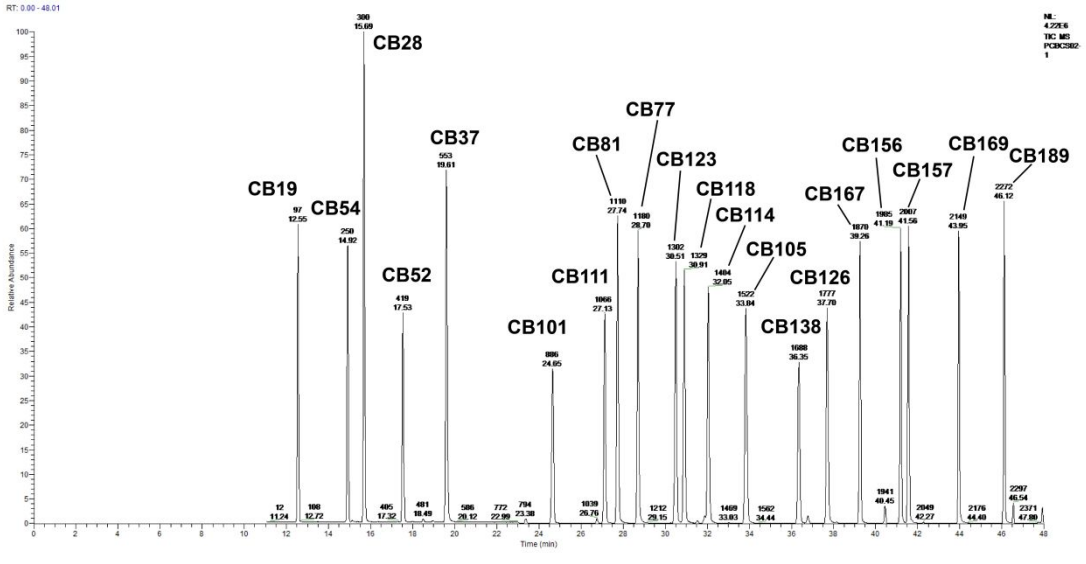

Fig. S1 The chromatogram of the $^{13}C_{12}$-labeled PCB internal standards.

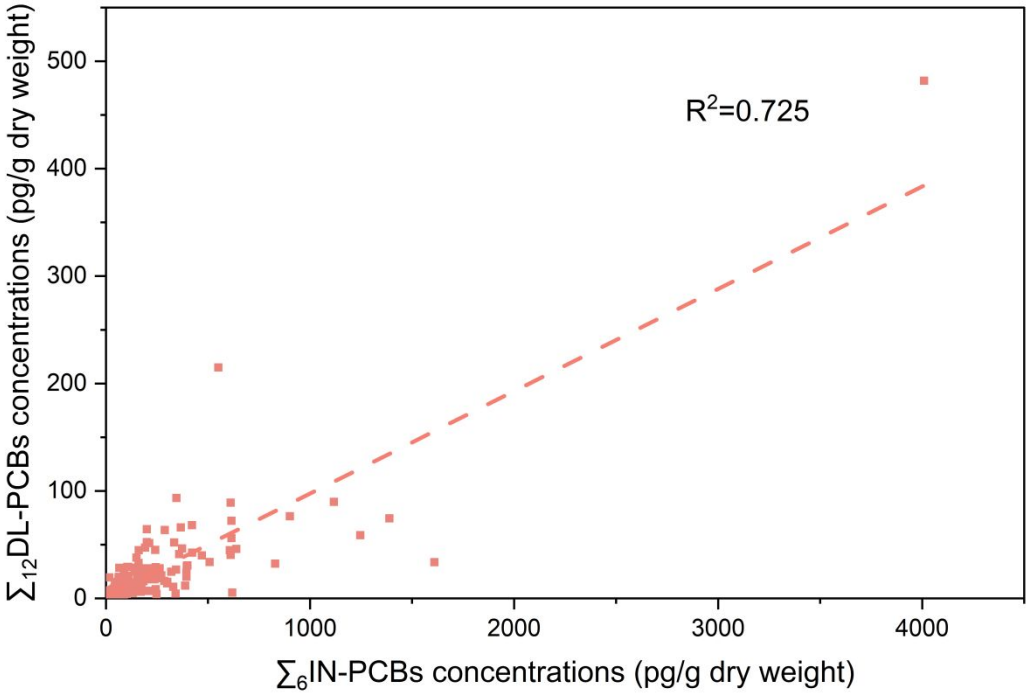

Fig. S2 Linear regression analysis of IN-PCBs and DL-PCBs in tea samples from six categories.

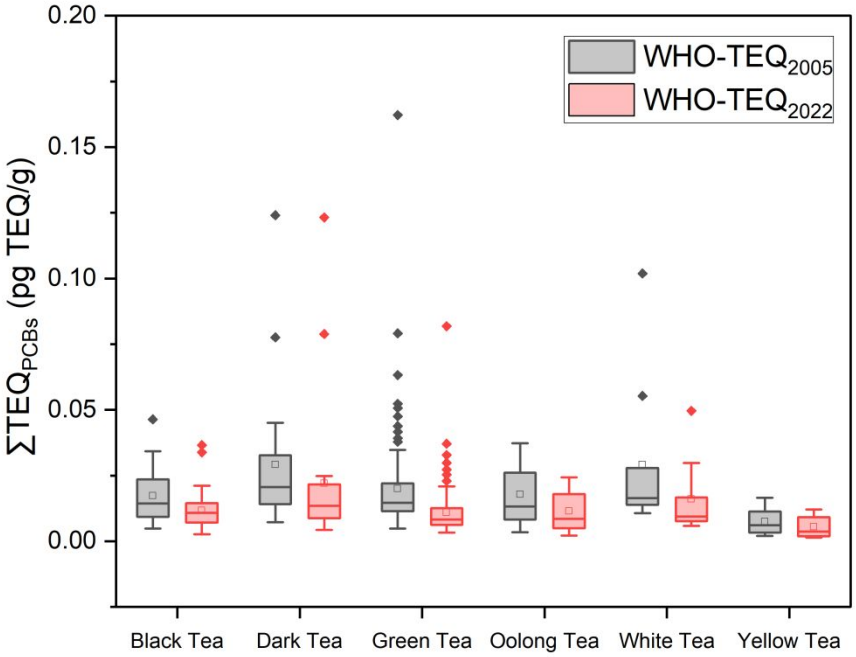

Fig. S3 TEQ values in six tea categories (based on WHO 2005 & 2022 TEFs)

22 **Table S1** The concentration (pg/g dw) of PCBs in tea samples from six tea categories.

	Min			Median			Mean			Max		
	$\sum_6$IN-PCBs	$\sum_{12}$DL-PCBs	$\sum_{18}$PCBs	$\sum_6$IN-PCBs	$\sum_{12}$DL-PCBs	$\sum_{18}$PCBs	$\sum_6$IN-PCBs	$\sum_{12}$DL-PCBs	$\sum_{18}$PCBs	$\sum_6$IN-PCBs	$\sum_{12}$DL-PCBs	$\sum_{18}$PCBs
Black tea	8.11	1.25	9.36	107	8.78	117	161	14.9	176	830	89.0	862
Dark tea	42.7	3.60	46.3	311	17.3	329	495	54.3	549	4010	482	4490
Green tea	7.36	2.59	10.4	68.7	9.31	79.0	168	18.3	186	1390	93.4	1460
Oolong tea	9.95	2.16	14.5	59.6	6.42	62.6	219	21.9	241	1610	66.0	1640
White tea	42.4	3.52	48.4	103	14.1	117	117	15.7	133	236	32.9	257
Yellow tea	16.6	1.21	18.5	36.4	5.79	38.6	84.0	9.35	93.3	244	29.0	273

Table S2 The concentrations of PCBs in food.

Compounds	Region	Testing sample	Range	Reference
$\sum_{23}$PCBs	Different geographical origins purchased from various Italian supermarkets	Black tea	2.03 ± 1.21 ng/g	[16]
$\sum_{23}$PCBs	Different geographical origins purchased from various Italian supermarkets	Green tea	4.31 ± 1.56 ng/g	
$\sum_{14}$PCBs	An e-waste recycling facility in North-Rhine Westphalia	Curly kale	4.5 - 45 μg/kg	[25]
$\sum_{14}$PCBs	An e-waste recycling facility in North-Rhine Westphalia	Spruce needles	20 - 540 μg/kg dw	
$\sum_{17}$PCBs	Five main agricultural areas (Shandong, Shanxi, Hubei, Liaoning, and Xinjiang) of China	Walnut	0.67 μg/kg	[24]
Indicator PCBs	Supermarkets in Zhejiang, China	Rice	20.6 pg/g ww	[22]
Indicator PCBs	Supermarkets in Zhejiang, China	Dairy products	0.3 - 0.5 ng/g fat	
Indicator PCBs	Supermarkets in Zhejiang, China	Infant formula	33.9 pg/g ww	
Indicator PCBs	Supermarkets in Zhejiang, China	Aquatic products	30.1 - 630 pg/g ww	
Indicator PCBs	Supermarkets in Zhejiang, China	Meat and their products	0.7 - 2.8 ng/g fat	
Indicator PCBs	Supermarkets in Zhejiang, China	Pork liver	7.4 pg/g ww	
Indicator PCBs	Supermarkets in Zhejiang, China	Marine fish oil	12.7 ng/g fat	
Indicator PCBs	A municipal waste incinerator in Zhejiang, China	Rice	41.3 pg/g ww	
Indicator PCBs	A municipal waste incinerator in Zhejiang, China	Chicken eggs	200 pg/g ww	
Indicator PCBs	An E-waste disassembling sites in Zhejiang, China	Rice	65.2 pg/g ww	
Indicator PCBs	An E-waste disassembling sites in Zhejiang,	Chicken eggs	1.2 ng/g ww	

	China			
Indicator PCBs	An E-waste disassembling sites in Zhejiang, China	Cabbages	0.4 ng/g ww	
Indicator PCBs	An E-waste disassembling sites in Zhejiang, China	Omnivorous freshwater fish	10.1 ng/g ww	
$\sum_{62}$PCBs	Nine of the largest cities in South Korea	Cereals and their products	0.127ng/g ww	[23]
$\sum_{62}$PCBs	Nine of the largest cities in South Korea	Meat, aquatic products and dairy products	0.183 - 1.456 ng/g ww	
$\sum_{62}$PCBs	Nine of the largest cities in South Korea	Vegetables and fruits	0.118 - 0.158 ng/g ww	
$\sum_{62}$PCBs	Nine of the largest cities in South Korea	Beverages	0.148 ng/g ww	
$\sum_{62}$PCBs	Nine of the largest cities in South Korea	Miscellaneous	0.176 ng/g ww	
Tr-to deca-CBs	Five food sampling regions in China	Meat and their products	1.0 -4.1 ng/g lw	[6]
Tr-to deca-CBs	Five food sampling regions in China	Dairy products	2.9 - 4.3 ng/g lw	
Tr-to deca-CBs	Five food sampling regions in China	Mixed animal fat	0.3 ng/g lw	
Tr-to deca-CBs	Five food sampling regions in China	Aquatic products	11.7 - 67.5 ng/g lw	
$\sum_{18}$PCBs	Five food sampling regions in China	Cereals	30678.3 - 46095.0 pg/kg fw	[11]
$\sum_{18}$PCBs	Five food sampling regions in China	Beans	35654.1 - 100790.7 pg/kg fw	
$\sum_{18}$PCBs	Five food sampling regions in China	Potatoes	5316.4 - 17605.6 pg/kg fw	

$\sum_{18}$PCBs	Five food sampling regions in China	Vegetables and edible fungi	5788.5 - 48451.2 pg/kg fw	
$\sum_{18}$PCBs	North coast region in China	Mixed vegetable oil	196047.3 pg/kg lw	
dlPCBs	Nine cities of South China	Fish	2550±4100 pg/g	[27]
dlPCBs	Nine cities of South China	Eggs	693±2810 pg/g	
dlPCBs	Nine cities of South China	Beef	250±377 pg/g	
dlPCBs	Nine cities of South China	Pork	29.9±27.5 pg/g	
$\sum_{6}$NDL-PCBs	Oyapock in French Guiana–Brazil	Cereals	0.015 ng/g ww	[1]
$\sum_{6}$NDL-PCBs	Oyapock in French Guiana–Brazil	Roots，tubers，and starchy foods	0.006 ng/g ww	
$\sum_{6}$NDL-PCBs	Oyapock in French Guiana–Brazil	Legumes	0.006 ng/g ww	
$\sum_{6}$NDL-PCBs	Oyapock in French Guiana–Brazil	Fruits	0.012 ng/g ww	
$\sum_{6}$NDL-PCBs	Littoral Caraïbes in Guadeloupe	Cereals	0.005 ng/g ww	
$\sum_{6}$NDL-PCBs	Littoral Caraïbes in Guadeloupe	Roots，tubers，and starchy foods	0.019 ng/g ww	
$\sum_{6}$NDL-PCBs	Littoral Caraïbes in Guadeloupe	Legumes	0.006 ng/g ww	
$\sum_{6}$NDL-PCBs	Littoral Caraïbes in Guadeloupe	Fruits	0.004 ng/g ww	
$\sum_{6}$NDL-PCBs	Littoral Caraïbes in Guadeloupe	Vegetables	0.008 ng/g ww	

$\sum_6$NDL-PCBs	Tessékéré in Senegal	Cereals	0.011 ng/g ww	
$\sum_6$NDL-PCBs	Tessékéré in Senegal	Roots，tubers，and starchy foods	0.016 ng/g ww	
$\sum_6$NDL-PCBs	Tessékéré in Senegal	Fruits	0.019 ng/g ww	
$\sum_6$NDL-PCBs	Tessékéré in Senegal	Vegetables	0.006 ng/g ww	
$\sum_6$NDL-PCBs	Tessékéré in Senegal	Oleaginous fruits and seeds	0.189 ng/g ww	
$\sum_6$NDL-PCBs	Tessékéré in Senegal	Dark green leafy vegetables	0.007 ng/g ww	
$\sum_6$NDL-PCBs	Estarreja in Portugal	Cereals	0.025 ng/g ww	
$\sum_6$NDL-PCBs	Estarreja in Portugal	Roots，tubers，and starchy foods	0.002 ng/g ww	
$\sum_6$NDL-PCBs	Estarreja in Portugal	Legumes	0.004 ng/g ww	
$\sum_6$NDL-PCBs	Estarreja in Portugal	Fruits	0.004 ng/g ww	
$\sum_6$NDL-PCBs	Estarreja in Portugal	Vegetables	0.018 ng/g ww	
$\sum_6$NDL-PCBs	Estarreja in Portugal	Dark green leafy vegetables	0.012 ng/g ww	
$\sum_6$NDL-PCBs	Large retail stores in several regions of Italy	Chicken eggs	0.42-0.66 ng/g fw	[28]

$\sum_{28}$PCBs	Markets in the southern part of Nigeria	Atlantic mackerel	1.470 ng/g	[26]
$\sum_{28}$PCBs	Markets in the southern part of Nigeria	Atlantic horse mackerel	1.340 ng/g	
$\sum_{28}$PCBs	Markets in the southern part of Nigeria	Herring	1.330 ng/g	
$\sum_{28}$PCBs	Markets in the southern part of Nigeria	Hake	1.200 ng/g	
$\sum_{28}$PCBs	Markets in the southern part of Nigeria	Croaker	1.36 ng/g	
$\sum_{28}$PCBs	Markets in the southern part of Nigeria	Tilapia	0.920 ng/g	

Table S3 The DL-PCB TEF values of WHO_{2005} and WHO_{2022}.

PCB congener	TEF_{2005}	TEF_{2022}
PCB-77	0.0001	0.0003
PCB-81	0.0003	0.006
PCB-105	0.00003	0.00003
PCB-114	0.00003	0.00003
PCB-118	0.00003	0.00003
PCB-123	0.00003	0.00003
PCB-126	0.1	0.05
PCB-156	0.00003	0.00003
PCB-157	0.00003	0.00003
PCB-167	0.00003	0.00003
PCB-169	0.03	0.005
PCB-189	0.00003	0.00003

Table S4 The adult population, import volume of China tea, and EWIs of PCBs *via* tea-drinking for the adults in 19 countries.

Country	Adult population (thousands)	Import volume ($\times 10^3$ tons)	EWI ($\times 10^{-3}$ pg WHO-TEQ /kg bw/week)
Morocco	24946	67.2	10.6
Uzbekistan	22010	23.0	4.11
Ghana	18077	18.7	4.07
Togo	4482	17.6	15.5
Senegal	8439	16.9	7.88
Russia	115438	14.8	0.505
Mauritania	2290	14.1	24.2
Algeria	28265	13.9	1.94
Cameroon	13457	13.6	3.98
Japan	106976	11.5	0.423
the United States	260590	9.66	0.146
Germany	69591	8.35	0.472
Poland	31460	6.09	0.762
Benin	6426	5.88	3.60
Malaysia	23862	5.63	0.929
Pakistan	127575	5.60	0.173
Gambia	1268	5.54	17.2
Vietnam	70492	5.08	0.284
Niger	10785	4.73	1.73