SUPPORTING INFORMATION 1

Exposure to contemporary and emerging chemicals in commerce among pregnant women in the United States: The Environmental influences on Child Health Outcomes (ECHO) Program

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Table S1. Characteristics of Participating ECHO Pregnancy Cohorts (N = 9)

Cohort name	Location(s)	Years of cohort enrollment (current study)	Recruitment timing and eligibility criteria	Cohort features	Number in pilot study	Number of blinded duplicates
Chemicals in Our Bodies (CiOB) [1-4]	San Francisco, California	2014–present (2014–2018)	Women seeking routine prenatal care and delivery services from three University of California, San Francisco hospitals were recruited at 12–28 weeks of pregnancy. Eligibility criteria included English or Spanish speakers, singleton birth, >=18 years of age, no major pregnancy complications.	Cohort is urban, racially and economically diverse, with 38% non-Hispanic White, 34% Latina, 19% Asian, and 8% Black women.	20	2
Illinois Kids Developmental Study (IKIDS) [4]	Champaign-Urbana, Illinois	2013–present (2019)	Women were recruited from two obstetric clinics at their first prenatal visit and enrolled at 10–14 weeks of gestation. Eligibility criteria included 18–40 years of age, not caring multiples, not in a high-risk pregnancy, fluent in English, not planning to leave the area before the child's first birthday.	Cohort is from a mid-size mid-western college town, predominantly non-Hispanic White and college-educated.	17	2
Maternal and Developmental Risks from Environmental and Social Stressors (MADRES) [5]	Los Angeles, California	2015–present (2016–2019)	Recruitment from community health centers in urban Los Angeles with a focus on medically underserved populations. Eligibility for participants at the time of recruitment included: (1) less than 30 weeks pregnant, (2) at least 18 years of age, and (3) a fluent speaker of English or Spanish. Exclusion criteria for the study included: (1) multiple gestation; (2) having a physical, mental, or cognitive disability that would prevent participation or ability to provide consent; (3) current incarceration; and (4) HIV positive status.	Participants are predominantly Hispanic and approximately 50% were born outside of the U.S.	20	2
Understanding Pregnancy Signals and Infant	Rochester, New York	2015–2019 (2019–2020)	1st trimester recruitment from academic-affiliated prenatal clinics with an underserved patient population. Eligibility criteria included: <14 weeks of gestation,	Enriched for maternal sociodemographic diversity and psychosocial stress through recruitment at	20	0

Cohort name	Location(s)	Years of cohort enrollment (current study)	Recruitment timing and eligibility criteria	Cohort features	Number in pilot study	Number of blinded duplicates
Development (UPSIDE) [6]			>=18 years of age, singleton pregnancy, no known substance abuse issues or history of psychotic illness, no major endocrine disorder, high-risk health condition, or significant obstetric concern at baseline.	clinics serving disproportionately high-need patients.		
Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) [7, 8 9]	Northern Puerto Rico	2011-present (2017–2018)	Women recruited at prenatal care visit. Eligibility criteria included <20 weeks of gestation, age 18–40 years, residence in Northern Karst region of Puerto Rico, no IVF or major pre-existing medical conditions (e.g. diabetes).	Hispanic cohort.	20	0
Atlanta African American Maternal-Child Cohort [10-12]	Atlanta, Georgia	2014 – present (2016–2018)	Pregnant women 18–40 years of age who self-reported as Black or African American, were born in the United States, had a singleton pregnancy at 8–14 weeks of gestation presenting for care at clinics affiliated with Emory University (Emory and Grady Health Systems) and who did not have IVF or pre-existing chronic medical conditions were invited to participate.	Black/African American cohort from metropolitan Atlanta.	20	0
Markers of Autism Risk in Babies: Learning Early Signs (MARBLES) [13]	Northern California	2006-present (2008–2015)	Pregnant women were eligible if they had a child or other first degree relative with autism spectrum disorder (ASD), were 18 years of age or older, spoke, read, and understood English, and lived within 2.5 hours of the Davis/Sacramento region at the time of enrollment. The families were primarily recruited from those who received state-funded services for ASD in Northern California.	Mothers of a child with autism.	14	6
Fair Start	New York City, New York	2013-present (2017–2019)	Pregnant women were enrolled from community obstetric clinics associated with New York Presbyterian Hospital. Eligibility criteria included English or Spanish	Urban residents of upper Manhattan and South Bronx, mainly Hispanic.	20	20

Cohort name	Location(s)	Years of cohort enrollment (current study)	Recruitment timing and eligibility criteria	Cohort features	Number in pilot study	Number of blinded duplicates
			speakers, singleton birth, >=18 years old, and no major pregnancy complications.			
New Hampshire Birth Cohort Study (NHBCS) [14, 15]	Concord and Lebanon, NH	2009-present (2017–2019)	Pregnant women 18–45 years of age were recruited at either ~12 weeks or ~ 24–28 weeks of gestation from prenatal clinics in New Hampshire. Eligibility criteria included English literacy, use of a private, unregulated water system at home, and a singleton pregnancy.	Participants are representative of the vulnerable group of rural pregnant women and are primarily non-Hispanic White, reflective of the underlying population of the region.	20	2

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Table S2. Description of Measured Parent Compounds, Chemicals, Individual Analytes, Composite Analytes, and Sums

Chemical group	Number of chemicals*	Number of parent compounds**	Number of analytes (N=89)				Sums (Σ)***
			Individual parent compounds	Composites of parent compounds	Individual metabolites	Composites of metabolites	
Total	**103**	**73**	**41**	**2**	**38**	**8**	
Bactericides	1	1	1	0	0	0	
Benzophenones	6	4	3	0	3	0	
Bisphenols	7	7	7	0	0	0	
Fungicides & herbicides	11	11	11	0	0	0	
Insecticides	19	14	9	1	6	1	
Organophosphate esters	11	8	4	1	3	1	
Parabens	6	6	6	0	0	0	
Phthalates & phthalate alternatives	31	18	0	0	25	3	4
Polycyclic aromatic hydrocarbons	11	4	0	0	1	3	

*Number of chemicals is the number of parent compounds and metabolites represented by the 89 analytes.

**Number of parent compounds is the number of parent compounds represented by the 89 analytes.

***We calculated a weighted molar sum (Σ) of metabolites for di-2-ethylhexyl phthalate (DEHP), di-isodecyl phthalate (DiDP), di-(2-propylheptyl) phthalate (DPHP), and di-iso-nonyl-cyclohexane-1,2-dicarboxylic acid (DINCH). The metabolites included in each sum were measured individually and subsequently summed for analysis because they are biomarkers of the same parent compound.

Table S3. Coefficients of Variation (CVs) of Quality Control (QC) Pooled Samples (A and B) and Median Relative Percent Differences (RPDs) of Blinded Duplicate Pairs.

			Replicate pooled aliquots			Duplicate sample aliquots	
Chemical group	**Chemical class**	**Analyte**	**QC pool**	**# of valid QC pairs**	**CV (%)**	**# of valid pairs**	**Median RPD (%)**
Bactericide	Bactericide	TCC	A	0	NC	0	NC
			B	0	NC		
Benzophenones	Benzophenones	BP2	A	0	NC	< 5	7.3
			B	0	NC		
Benzophenones	Benzophenones	BP8	A	0	NC	11	30.8
			B	0	NC		
Benzophenones	Benzophenones	4-OHBP	A	5	12	27	21.8
			B	6	4		
Benzophenones	Benzophenones	BP1	A	6	4	32	12.6
			B	6	3		
Benzophenones	Benzophenones	BP3	A	6	9	32	26.9
			B	6	8		
Bisphenols	Bisphenols	BPA	A	6	16	14	70.8
			B	6	11		
Bisphenols	Bisphenols	BPAF	A	0	NC	0	NC
			B	0	NC		
Bisphenols	Bisphenols	BPB	A	0	NC	0	NC
			B	0	NC		
Bisphenols	Bisphenols	BPF	A	0	NC	5	38.4
			B	0	NC		
Bisphenols	Bisphenols	BPS	A	6	5	28	18.3
			B	6	2		
Bisphenols	Bisphenols	BPZ	A	0	NC	n < 5	58.7
			B	0	NC		
Fungicides & herbicides	Fungicides	2,4,5-T	A	0	NC	18	16.1
			B	0	NC		
Fungicides & herbicides	Fungicides	PNP	A	0	NC	15	53.1
			B	0	NC		
Fungicides &	Fungicides	MET	A	0	NC	0	NC

herbicides			B	0	NC		
Fungicides & herbicides	Fungicides	PCP	A	0	NC	19	56.4
			B	0	NC		
Fungicides & herbicides	Fungicides	PYRM	A	0	NC	0	NC
			B	0	NC		
Fungicides & herbicides	Herbicides	2,4-D	A	0	NC	n < 5	71.2
			B	0	NC		
Fungicides & herbicides	Herbicides	ATZ	A	6	7	13	60.1
			B	6	10		
Insecticides	Neonicotinoids	6-CNA	A	0	NC	0	NC
			B	0	NC		
Insecticides	Neonicotinoids	ACE	A	0	NC	0	NC
			B	0	NC		
Insecticides	Neonicotinoids	CLO	A	0	NC	n < 5	17.5
			B	0	NC		
Insecticides	Neonicotinoids	IMI	A	0	NC	n < 5	82.1
			B	0	NC		
Insecticides	Neonicotinoids	NDMA	A	6	1	31	32.4
			B	6	2		
Insecticides	Neonicotinoids	NIT	A	0	NC	NC	NC
			B	0	NC		
Insecticides	Neonicotinoids	THX	A	6	3	28	45.1
			B	6	5		
Insecticides	Organochlorine	2,4,5-/2,4,6-TCP	A	0	NC	0	NC
			B	0	NC		
Insecticides	Organophosphate	TCP	A	6	3	31	16.2
			B	6	1		
Insecticides	Other	SUF	A	0	NC	n < 5	25.2
			B	0	NC		
Insecticides	Pyrethroids	DCCA	A	0	NC	n < 5	23
			B	0	NC		
Insecticides	Pyrethroids	PBA	A	6	8	n < 5	23
			B	6	12		
Insecticides	Pyrethroids	FPBA	A	0	NC	n < 5	9.1
			B	0	NC		
Organophosphate	Organophosphate	BDCIPP	A	0	NC	20	35.1

esters	esters		B	0	NC		
Organophosphate esters	Organophosphate esters	DBuP/DiBP	A	0	NC	0	NC
			B	0	NC		
Organophosphate esters	Organophosphate esters	DPHP	A	6	2	32	10
			B	6	6		
Organophosphate esters	Organophosphate esters	TEP	A	0	NC	6	44.2
			B	0	NC		
Organophosphate esters	Organophosphate esters	TnBP/TiBP	A	0	NC	n < 5	32.2
			B	0	NC		
Organophosphate esters	Organophosphate esters	TCEP	A	0	NC	0	NC
			B	0	NC		
Parabens	Parabens	BzPB	A	0	NC	0	NC
			B	0	NC		
Parabens	Parabens	BuPB	A	0	NC	6	43.5
			B	0	NC		
Parabens	Parabens	EtPB	A	6	9	26	18.5
			B	6	8		
Parabens	Parabens	MePB	A	6	1	33	17.2
			B	6	4		
Parabens	Parabens	PrPB	A	6	4	28	9.8
			B	6	4		
Phthalates & phthalate alternatives	Phthalate alternatives	MCOCH	A	6	2	17	13.8
			B	6	1		
Phthalates & phthalate alternatives	Phthalate alternatives	MHNCH	A	1	1	20	9.7
			B	1	1		
Phthalates & phthalate alternatives	Phthalate alternatives	MONCH	A	6	1	5	11.9
			B	6	2		
Phthalates & phthalate alternatives	Phthalates	MCMHP/MCHPP	A	0	NC	28	19.9
			B	0	NC		
Phthalates & phthalate alternatives	Phthalates	MEHHP	A	6	4	33	10.6
			B	6	2		

Phthalates & phthalate alternatives	Phthalates	MEOHP	A	6	5	32	12
			B	6	2		
Phthalates & phthalate alternatives	Phthalates	MHPP	A	0	NC	n < 5	22.9
			B	0	NC		
Phthalates & phthalate alternatives	Phthalates	MPCHP	A	6	5	32	9.5
			B	6	5		
Phthalates & phthalate alternatives	Phthalates	MPHHP	A	6	3	5	12
			B	6	2		
Phthalates & phthalate alternatives	Phthalates	MPOHP	A	6	3	27	9.8
			B	6	1		
Phthalates & phthalate alternatives	Phthalates	MECPP	A	6	4	34	10
			B	6	3		
Phthalates & phthalate alternatives	Phthalates	MCOMOP	A	6	15	23	42.8
			B	6	3		
Phthalates & phthalate alternatives	Phthalates	MBzP	A	0	NC	10	14.5
			B	0	NC		
Phthalates & phthalate alternatives	Phthalates	MCiNP	A	6	3	32	11.1
			B	6	1		
Phthalates & phthalate alternatives	Phthalates	MCiOP	A	6	2	33	10.1
			B	6	1		
Phthalates & phthalate alternatives	Phthalates	MEHP	A	6	5	32	30.2
			B	6	1		
Phthalates & phthalate alternatives	Phthalates	MEP	A	6	1	34	8.3
			B	6	1		

Phthalates & phthalate alternatives	Phthalates	MHiDP	A	6	4	32	16.4
			B	6	4		
Phthalates & phthalate alternatives	Phthalates	MiPP/MPrP	A	0	NC	13	50.6
			B	0	NC		
Phthalates & phthalate alternatives	Phthalates	MMP	A	0	NC	18	41.9
			B	0	NC		
Phthalates & phthalate alternatives	Phthalates	MnBP/MiBP	A	6	1	34	11.1
			B	6	1		
Phthalates & phthalate alternatives	Phthalates	MOP	A	0	NC	7	60.4
			B	0	NC		
Phthalates & phthalate alternatives	Phthalates	MPeP	A	0	NC	n < 5	25.4
			B	0	NC		
Phthalates & phthalate alternatives	Terephthalates	MBzTP	A	0	NC	0	NC
			B	0	NC		
Phthalates & phthalate alternatives	Terephthalates	METP	A	0	NC	0	NC
			B	0	NC		
Phthalates & phthalate alternatives	Terephthalates	MTBTP	A	0	NC	< 5	17.3
			B	0	NC		
Polycyclic aromatic hydrocarbons	Polycyclic aromatic hydrocarbons	FLUOs	A	6	3	16	25.5
			B	6	1		
Polycyclic aromatic hydrocarbons	Polycyclic aromatic hydrocarbons	NAPs	A	6	3	34	11.4
			B	6	2		
Polycyclic aromatic hydrocarbons	Polycyclic aromatic hydrocarbons	PHENs	A	0	NC	17	20.1
			B	0	NC		

Polycyclic aromatic hydrocarbons	Polycyclic aromatic hydrocarbons	1-OHP	A	0	NC	n < 5	18.3
			B	0	NC		

2,4-D, 2,4-dichlorophenoxyacetic acid; 2,4,5-T, 2,4,5-trichlorophenoxyacetic acid; 4-OHBP, 4-hydroxybenzophenone; ATZ, atrazine; BDCIPP, bis(1,3-dichloro-2-propyl) phosphate; BP1, benzophenone-1; BP3, benzophenone-3; BP8, 2,2'-dihydroxy-methoxybenzophenone; BPA, bisphenol A; BPF, bisphenol F; BPS, bisphenol S; BPZ, bisphenol Z; BuPB, butyl paraben; BzPB, benzyl paraben; CLO, clothianidin; DCCA, 3-(2,-di-chlorovinyl)-2,2-dimethyl-cyclopropane-1-carboxylic acid; ∑DEHP, molar sum of di-2-ethylhexyl phthalate metabolites; ∑DiDP, molar sum of di-iso-decyl phthalate metabolites; ∑DINCH, molar sum of di-iso-nonyl-cyclohexane-1,2-dicarboxylic acid metabolites; ∑DPHP, molar sum of di-(2-propylheptyl) phthalate metabolites; DPHP, diphenyl phosphate; EtPB, ethyl paraben; FLUOs, composite of 2-, 3-, and 9-hydroxyfluorene; FPBA, 4-fluoro-3-phenoxybenzoic acid; IMI, imidacloprid; MBzP, monobenzyl phthalate; MEP, monoethyl phthalate; MePB, methyl paraben; MHPP, mono-2-heptyl phthalate; MiPP/MPrP, composite of mono-isopropyl phthalate and mono-propyl phthalate; MMP = monomethyl phthalate; MnBP/MiBP = composite of mono-n-butyl phthalate and mono-iso-butyl phthalate; MOP, mono-n-octyl phthalate; NAPs, composite of 1- and 2-hydroxynaphthalene; NDMA, N-desmethyl acetamiprid; NIT, nitenpyram; PCP, pentachlorophenol; PHENs, composite of 1-, 2-, 3-, 4-, and 9-hydroxyphenanthrene; PNP, 4-nitrophenol; PrPB, propyl paraben; SUF, sulfoxaflor; TCC, triclocarban; TCP, 3,5,6-trichloro-2-pyridinol; TEP, triethyl phosphate; THX, thiamethoxam; TnBP/TiBP, composite of tri-n-butyl phosphate and tri-iso-butyl phosphate.

Table S4. Sociodemographic characteristics of pregnant women in the study sample, 9 participating cohorts, and 68 ECHO cohorts. All statistics are sample size (%) unless noted otherwise.

Demographic characteristics	**Study sample (n = 171)**	**Participating cohorts (n = 7,420)**
Age at delivery (years); mean (SD)	29.5 (5.3)	30.7 (5.5)
Missing	0	1,192
Age at delivery category		
< 25	35 (20)	945 (15)
25 to < 30	51 (30)	1,572 (25)
30 to < 35	47 (28)	2,096 (34)
≥ 35	38 (22)	1,615 (26)
Missing	0	1,192
Race/ethnicity		
Non-Hispanic White	57 (34)	3,300 (46)
Non-Hispanic Black/African American	34 (20)	786 (11)
Non-Hispanic Other or multiple race	11 (6)	436 (6)
Hispanic	68 (40)	2,599 (37)
Missing	1	299
Highest educational attainment		
Less than high school	16 (10)	413 (7)
High school degree, GED, or equivalent	28 (17)	972 (17)
Some college, Associate's degree, or trade/vocational school	45 (27)	1,293 (23)
Bachelor's degree	36 (22)	1,638 (29)
Master's, professional, or doctorate degree	39 (24)	1,393 (24)
Missing	7	1,711
Marital status		
Single; partnered, not living together	45 (27)	1,045 (18)
Widowed; separated; divorced	8 (5)	325 (6)
Married or living with a partner	112 (68)	4,388 (76)
Missing	6	1,662
Pre- or early pregnancy BMI (kg/m^2); mean (SD)	26.4 (6.5)	26.4 (6.4)
Missing	12	1,667
Year of delivery		
1980 – 1989	0 (0)	0 (0)

1990 – 1999	0 (0)	0 (0)
2000 – 2009	< 5 (< 2%)	204 (3)
2010 – 2021	> 166 (> 98%)	7,152 (97)
Missing	0	64

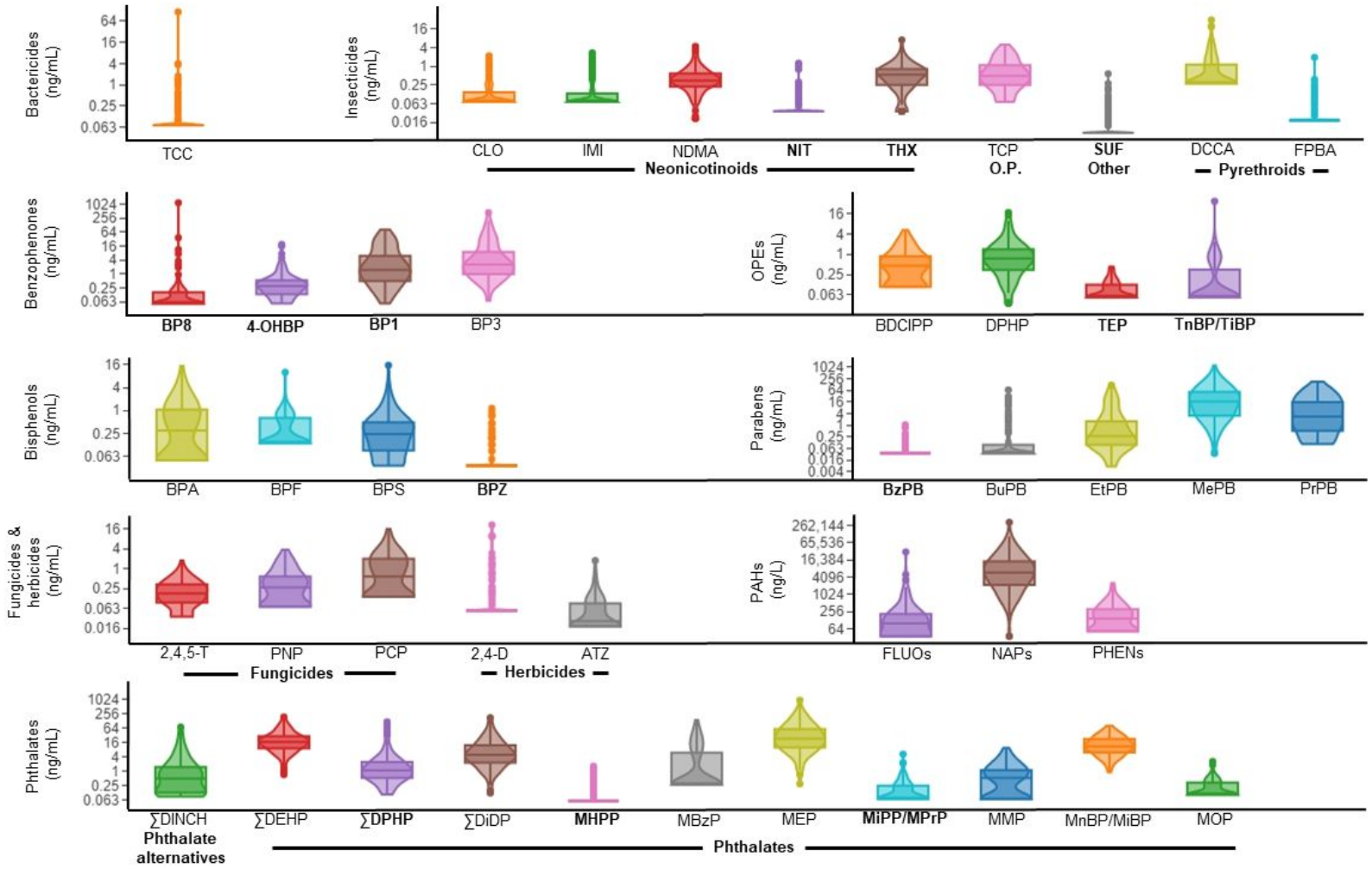

Figure S1. Violin plot of $\log_2$-transformed urinary analyte concentrations measured among 171 pregnant women in ECHO. Includes analytes detected in at least three cohorts and 10% of the overall study sample. Values below the limit of detection (LOD) were set to the LOD/√2. Bolding indicates analytes not previously included in NHANES biomonitoring. 2,4-D, 2,4-dichlorophenoxyacetic acid; 2,4,5-T, 2,4,5-trichlorophenoxyacetic acid; 4-OHBP, 4-hydroxybenzophenone; ATZ, atrazine; BDCIPP, bis(1,3-dichloro-2-propyl) phosphate; BP1, benzophenone-1; BP3, benzophenone-3; BP8, 2,2'-dihydroxy-methoxybenzophenone; BPA, bisphenol A; BPF, bisphenol F; BPS, bisphenol S; BPZ, bisphenol Z; BuPB, butyl paraben; BzPB, benzyl paraben; CLO, clothianidin; DCCA, 3-(2,-di-

chlorovinyl)-2,2-dimethyl-cyclopropane-1-carboxylic acid; ∑DEHP, molar sum of di-2-ethylhexyl phthalate metabolites; ∑DiDP, molar sum of di-iso-decyl phthalate metabolites; ∑DINCH, molar sum of di-iso-nonyl-cyclohexane-1,2-dicarboxylic acid metabolites; ∑DPHP, molar sum of di-(2-propylheptyl) phthalate metabolites; DPHP, diphenyl phosphate; EtPB, ethyl paraben; FLUOs, composite of 2-, 3-, and 9-hydroxyfluorene; FPBA, 4-fluoro-3-phenoxybenzoic acid; IMI, imidacloprid; MBzP, monobenzyl phthalate; MEP, monoethyl phthalate; MePB, methyl paraben; MHPP, mono-2-heptyl phthalate; MiPP/MPrP, composite of mono-isopropyl phthalate and mono-propyl phthalate; MMP = monomethyl phthalate; MnBP/MiBP = composite of mono-n-butyl phthalate and mono-iso-butyl phthalate; MOP, mono-n-octyl phthalate; NAPs, composite of 1- and 2-hydroxynaphthalene; NDMA, N-desmethyl acetamiprid; NIT, nitenpyram; PCP, pentachlorophenol; PHENs, composite of 1-, 2-, 3-, 4-, and 9-hydroxyphenanthrene; PNP, 4-nitrophenol; PrPB, propyl paraben; SUF, sulfoxaflor; TCC, triclocarban; TCP, 3,5,6-trichloro-2-pyridinol; TEP, triethyl phosphate; THX, thiamethoxam; TnBP/TiBP, composite of tri-n-butyl phosphate and tri-iso-butyl phosphate