Supporting Information

Ecotoxicological assessment of pharmaceuticals and personal care products using predictive toxicology approaches

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Table S1 Reported concentration and ecotoxicity data of different pharmaceuticals and related substances in diverse samples (country wise).

Class	Pharmaceuticals and accessories	Country	Sample	Concentration reported (ng/l)	Analytical method	Toxicological Endpoint/ Assay method	Ecotoxicity Data (mg/l)	Ref.[#]
Antibiotics	Ciprofloxacin	Germany	Surface water	60		-	-	29
		Switzerland	Surface water	5-18		-	-	29
		Switzerland	WWTP effluent	55-405	-	-	-	29
		France	WWTP effluent	60	-	-	-	29
		USA	Surface water	20	SPE-LC–MS	-	-	144
		USA	STP influent	ND-1000	SPEHPLC-MS/MS	-	-	145
		Italy	River water	ND-26.15	SPEHPLC-MS/MS	-	-	146
		Sweden	STP influent	90-300	SPE-LC–MS	-	-	145
	Enrofloxacin	Portugal	STP influent	121.8-447.1	SPE-LC-FD	*A. fischeri*, EC_{50} (15 min)	326.8	145

						(luminescence)		
		Japan	WWTP influent	7-85		-	-	29
		USA	STP influent	250	SPE-LC–MS	*D. magna*, EC_{50} (48 h) (immobilization)	131.7	145
	Levofloxacin	South Korea	River water	ND-87.4 (±13)	SPE-LC-MS/MS	*D. magna,* EC_{50} (21 d) (reproduction)	0.34	147
		Japan	WWTP influent	255-587	-	-	-	29
	Norfloxacin	USA	Surface water	120	SPE-LC–MS	*S. obliquus*, IC_{50} (48 h) (growth inhibition)	38.49	144
		Portugal	STP influent	191.2-455.0	SPE-LC-FD	*S. capricornutum*, EC_{50} (growth inhibition)	16.6	148
		Sweden	STP influent	72-174	SPE-LC–MS	NOEC (growth inhibition)	4.01	148
		China	Surface seawater	<13	SPEHPLC-MS/MS	NOEC (growth inhibition)	4.02	148
		China	WWTP	460	-	-	-	29

			influent					
		China	WWTP effluent	85-320	-	-	-	29
		Japan	WWTP influent	155-486	-	-	-	29
	Ofloxacin	USA	STP influent	ND-1000	SPEHPLC-MS/MS	*T. platyurus*, LC_{50} (24 h) (mortality)	33.98	149
		USA	WWTP effluent	110-1000		-	-	29
		Portugal	STP influent	ND	SPE-LC-FD	*D. magna*, EC_{50} (24 h) (immobilization)	31.75	149
		Sweden	STP influent	<6-287	SPE-LC–MS	*C. dubia*, EC*50* (24 h) (immobilization)	17.41	149
		China	Harbour seawater	5.2-10	SPE-HPLC–MS	*C. dubia*, EC_{50} (7 d) (growth inhibition)	3.13	149
	Naldixic acid	Japan	WWTP influent	7-40	SPEHPLC–MS/MS	-	-	29
		Taiwan	STP influent	26-372	SPEHPLC–	-	-	83

					MS/MS			
	Ampicillin	Taiwan	Hospital effluent	21	SPEHPLC-MS/MS	*A. fischeri*, EC_{50} (15 min) (luminescence)	2627	145
	Penicillin G	China	STP influent	153,000±4000	SPE-LC–MS	*M. aeruginosa*, EC_{50} (growth rate)	0.006	150
	Cephalexin	China	Surface seawater	<13-182	SPEHPLC-MS/MS	-	-	149
		Taiwan	STP influent	1563–4367	SPEHPLC–MS/MS	-	-	83
	Lincomycin	USA	Surface water	60	SPE-LC–MS	*B. calyciflorus*, LC_{50} (24 h) (mortality)	24.94	149
		USA	Ground water	320	SPE-LC–MS	*T. platyurus,* LC_{50} (24 h) (mortality)	30.00	149
		USA	Hospital effluent	ND-2000	SPEHPLC–MS/MS	*D. magna* EC50 (24 h) (immobilization)	23.18	83
		Italy	River water	3.13-248.90	SPEHPLC-MS/MS	*B. calyciflorus*, EC_{50} (48 h) (growth inhibition)	0.68	149
	Clarithromycin	Italy	River water	0.49-20.30	SPEHPLC-	*B. calyciflorus*,	35.46	149

					MS/MS	LC_{50} (24 h) (mortality)		
		Taiwan	STP influent	59-1433	SPEHPLC-MS/MS	*B. calyciflorus*, EC_{50} (48 h) (growth inhibition)	12.21	149
		South Korea	River water	ND-443 (±14)	SPE-LC–MS/MS	*D. magna*, EC_{50} (24 h) (immobilization)	25.72	147
	Erithromycin	Italy	Po River water	1.4-15.9	SPEHPLC–MS/MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	5.62	83
		South Korea	STP effluent	8.9-294	SPE-LC–MS/MS	*T. platyurus,* LC_{50} (24 h) (mortality)	>100	89
		South Korea	Mankyung river water	ND–137 (±15)	SPE-LC–MS/MS	*O. latipes*, LC50 (96 h) (mortality)	>100	83
	Roxithromycin	USA	Surface water	50	SPE-LC–MS	-	-	83
		China	Victoria Harbour	5.1-6.1	SPE-HPLC–MS	-	-	83
	Spiramycin	Italy	Po river water	ND-43.80	SPE-HPLC-MS/MS	*M. aeruginosa,* EC_{50} (growth rate)	0.005	150
	Tylosin	USA	Surface water	40	SPE-LC–MS	*M. aeruginosa,* EC_{50} (growth rate)	0.034	150

		Italy	Po river water	ND-0.30	SPE-HPLC-MS/MS	*S. capricornutum* EC50 (growth rate)	1.38	150
	Sulfachloropyridazine	Korea	STP influent	<30-476	SPE-LC–MS	*A. fischeri*, EC_{50} (15 min)	26.4	83
	Sulfadiazine	Italy	River water	236	SPE-LC–MS	*M. aeruginosa*, EC_{50} (72 h) (growth inhibition)	0.135	83
		China	Victoria Harbour seawater	ND	SPE-HPLC–MS	*S. capricornutum EC50 (72 h) (growth inhibition)*	7.8	83
	Sulfadimethoxine	USA	Surface water	60	SPE-LC–MS	*A. fischeri*, EC_{50} (15 min)	>500	151
		USA	Ground water	46-68	SPE-LC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	248	151
		Taiwan	Hospital effluent	ND	SPEHPLC-MS/MS	*D. magna*, EC_{50} (96 h) (immobilization)	204.5	151
		Luxembourg	STP influent	0.3–-6	SPE-LC–MS/MS	*O. latipes*, LC_{50} (48 h)	>100	151
		Italy	River water	28	SPE-LC–MS	*S. capricornutum* EC_{50} (growthinhibition)	2.30	148
		Korea	STP influent	<10–213	SPE-LC–MS	*O. latipes,* LC50 (96 h)	>100	83

	Sulfamethazine	USA	Groundwater	76-215	SPE-LC–MS/MS	*V. fischeri*, EC_{50} (15 min)	344.7	151
		USA	STP influent	160	SPE-LC–MS	*O. latipes*, LC_{50} (96 h)	>100	151
		Luxembourg	STP influent	0.3-2	SPE-LC–MS/MS	*O. latipes*, LC_{50} (48 h)	>100	151
		Taiwan	Hospital effluent	ND	SPEHPLC–MS/MS	*D. magna EC50 (96 h) (immobilization)*	158.8	151
		Taiwan	Industry effluent	178	SPEHPLC–MS/MS	-	-	151
	Sulfamethoxazole	USA	Surface water	150	SPE-LC–MS	*A. fischeri*, EC_{50} (15 min)	78.1	151
		USA	Ground water	1110	SPE-LC–MS	*D. magna*, EC_{50} (48 h) (immobilization)	189.2	151
		USA	Drinking water	0.32	SPE-LC–MS/MS	*D. magna*, EC_{50} (96 h) (immobilization)	177.3	151
		Taiwan	STP influent	179-1760	SPEHPLC-MS/MS	*O. latipes*, LC_{50} (96 h)	562.5	151
		South Korea	STP effluent	3.8-407	SPE-LC–MS/MS	LOEC (96 h) (morphology)	10	152

		Sweden	STP influent	<80-674	SPE-LC–MS	EC50 (48 h) (growth inhibition)	9.63	149
		Italy	Drinking water	13-80	SPE-LC–MS	*T. platyurus,* LC_{50} (24 h) (mortality)	35.36	149
		China	Victoria Harbour	ND	SPE-HPLC–MS	*D. magna,* EC50 (24 h) (immobilization)	25.20	149
		China	Pearl River water	37-134	-	*C. dubia,* EC50 (24 h) (immobilization)	15.51	149
	Sulfathiazole	Luxembourg	STP influent	0.3-2	SPE-LC–MS/MS	*V. fischeri*, EC_{50} (15 min)	>1000	83
		South Korea	STP influent	<30-531	SPE-LC–MS	*D. magna*, LOEC (21 d) (reproduction)	35	83
	Sulfapyridine	Italy	Tevere river water	<12–121	SPE-LC–MS	*Hydra attenuata*, LC50 (96 h)(morphology)	>100	152
	Chlortetracycline	USA	Surface water	420	SPE-LC–MS	*M. aeruginosa*, EC_{50} (growth rate)	0.05	150
		Taiwan	Hospital effluent	ND	SPEHPLC-MS/MS	*S. capricornutum*, EC*50* (growth rate)	3.1	150

		Taiwan	Industry effluent	5.7	-	*V. fischeri,* EC_{50} (15 min) (luminescence)	13	150
	Oxytetracycline	USA	Surface water	340	SPE-LC–MS	*Hydra attenuata* LC_{50} (96 h) (morphology)	>100	152
		Italy	River water	ND-19.2	SPEHPLC-MS/MS	*Hydra attenuata* EC_{50} (96 h) (morphology)	40.13	152
		Taiwan	Hospital effluent	2.9	SPEHPLC–MS/MS	LOEC (96 h) (morphology)	100	152
		Luxembourg	STP influent	0.3-7	SPE-LC–MS/MS	NOEC (96 h) (morphology)	50	152
	Tetracycline	USA	Surface water	110	SPE-LC–MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	1.06	149
		USA	STP influent	520	SPE-LC–MS	EC_{50} (21 d) (reproduction)	44.8	145
		Taiwan	STP influent	46-234	SPEHPLC-MS/MS	*S. capricornutum* EC_{50} (growth rate)	2.2	150
		Luxembourg	STP influent	0.3-85	SPE-LC–MS/MS	*D. magna*, NOEC (48 h) (immobilization)	340	145

		China	Surface seawater	<13-122	SPEHPLC-MS/MS	-	-	145
	Metronidazole	Taiwan	STP influent	1-294	SPEHPLC–MS/MS	*D. magna*, LOEC (48 h) (immobilization)	1000	83
	Trimethoprim	USA	Drinking water	<0.25	SPE-LC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	167.4	151
		USA	Surface water	150	SPE-LC–MS	*A. fischeri* EC50 (15 min)	176.7	151
		USA	STP influent	ND–1400	SPEHPLC–MS/MS	LOEC (96 h) (morphology)	>100	152
		Serbia	Riverwater	25	SPE-LC–MS/MS	*D. magna*, EC_{50} (96 h) (immobilization)	120.7	151
		South Korea	STP effluent	10-188	SPE-LC–MS/MS	*O. latipes*, LC_{50} (96 h)	>100	151
		China	Surface seawater	<13-21.8	SPEHPLC-MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	149	145
Antidepressants	Fluoxetine	USA	Surface water	12	SPE-LC–MS	*H. azteca* LOEC (28 d) (growth)	0.1	153

		USA	Ground water	56	SPE-HPLC–MS	*H. azteca* NOEC (28 d) (growth)	0.033	153
		USA	Drinking water	0.64	SPE-LC–MS/MS	*D. magna*, OEC (21 d) (newborneslenght)	0.0089	153
		South Korea	STP effluent	1.7	SPE-LC–MS/MS	*D. magna*, LOEC (21 d) (newborneslenght)	0.031	153
		Norway	STP influent	0.4-2.4	SPE-HPLC–MS	*P. antipodarum* NOEC (reproduction)	0.013	153
		Canada	STP influent	3.1 (±0.3)-3.5	SPE-LC–MS/MS	*Gammarus pulex* LOEC (behaviour)	0.0001	153
	Norfluoxetine	USA	Drinking water	0.77	SPE-LC–MS/MS	-	-	154
		Norway	STP influent	0.7 (±13.1)-9.3	HPLC–MS	-	-	154
		Canada	STP influent	1.8 (±0.3)-4.2	SPE-LC–MS/MS	-	-	154
	Fluvoxamine	Norway	STP influent	0.4-3.9	SPE-HPLC–MS	*P. subscapitata*, IC_{50} (96 h) (growth inhibition)	4.003	83
	Paroxetine	Norway	STP influent	0.6-12.3	SPE-HPLC–	*D. magna*, EC_{50} (48 h)	2.5	83

					MS	(immobilization)		
		Canada	STP influent	4.6-5.3	SPE-LC–MS/MS	-	-	83
	Sertraline	Norway	STP influent	1.8-2.5	SPE-HPLC–MS	*V. fischeri* EC_{50} (30 min) (inhibition)	10.72	154
		Canada	STP influent	6.0 (±0.4)	SPE-LC–MS/MS	*A. fischeri*, LOEC (30 min) (inhibition)	4.5	154
	Citalopram	Norway	STP influent	13-612	SPE-HPLC–MS	-	-	153
		Canada	STP influent	52.2-52.7	SPE-LC–MS/MS	-	-	153
Antineoplasic /Anticancer drugs	Cyclophosphamide	Romania	River water	<30-64.8 (±8.0)	SPE-GC–MS	*P. subcapitata*, EC_{50} (72 h) (growth inhibition)	>100	31
		Italy	STP influent	<1.9-9.0	SPEHPLC-MS/MS	*P. subcapitata*, NOEC (72 h) (growth inhibition)	>100	31
		Switzerland	STP influent	2.0-6	SPE-LC–MS/MS	*D. magna*, LOEC (21 d) (reproduction)	100	31
	Methotrexate	Italy	STP influent	<0.83–12.6	SPEHPLC–	*A. fischeri*, EC_{50} (30 min)	1220	83

					MS/MS			
	Tamoxifen	United Kingdom	STP influent	143-215	SPEHPLC-MS/MS	*B. calyciflorus* LC_{50} (24 h) (mortality)	0.97	31
	Ifosfamide	Switzerland	STP influent	<0.3–5	SPE-LC–MS/MS	-	-	83
Antiepileptic	Carbamazepine	Spain	STP influent	120-310	SPE-GC–MS	*D. magna*, EC_{50} (48 h) (immobilization)	>100	155
		Finland	STP influent	290-400	SPEHPLC-MS/MS	*D. subspicatus* EC_{50} (growth inhibition)	74	155
		Romania	River water	<30-75.1 (±6.1)	SPE-GC–MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	25.5	155
		Sweden	STP influent	1680	SPE-LC–MS/MS	*Gammarus pulex* LOEC (behaviour)	0.00001	134
		Germany	Ground water	900	SPE-GC–MS	*T. platyurus* LC_{50} (24 h) (mortality)	>100	147
		USA	Drinking water	6.8	SPE-LC–MS/MS	*O. latipes*, LC_{50} (96 h)	45.87	147
		Japan	STP influent	14.9-270	SPE-GC–MS	*O. latipes*, LC_{50} (48 h)	35.4	151

		South Korea	Drinking water	<1.0	SPE-LC–MS/MS	*A. fischeri*, EC_{50} (30 min)	>81	30
		Italy	STP effluent	ND–1318	SPEHPLC-MS/MS	*D. magna*,EC50 (48 h) (immobilization)	>13.8	30
		France	STP influent	193–420	SPE-LC–MS	NOEC (7d) (reproduction)	0.025	30
		Serbia	Danube river water	8-130	SPE-LC–MS/MS	EC_{50} (96 h) (immobilization)	76.3	155
		Taiwan	STP influent	82–357	SPEHPLC–MS/MS	*O. latipes*, LC_{50} (96 h)	35.4	155
	Carbamazepine-10,11-epoxide	Spain	STP influent	300-500	SPE-GC–MS	-	-	83, 155
		France	STP influent	ND-27	SPE-LC–MS	-	-	83, 155
β-blockers	Atenolol	Finland	STP influent	510-800	SPEHPLC-MS/MS	*T. platyurus* LC_{50} (24 h) (mortality)	>100	147
		Sweden	STP influent	30	SPE-LC–MS/MS	*O. latipes*, LC_{50} (96 h)	>100	147
		Italy	Po River water	3.44-39.43	SPEHPLC-MS/MS	*D. subspicatus* EC_{50} (growth inhibition)	620	146

		Italy	STP influent	27-1168	SPEHPLC–MS/MS	LOEC (21 d) (condition index)	3.2	32
		USA	Drinking water	0.47	SPE-LC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	313	32
		Spain	Hospital effluent	100-122,000	SPEHPLC-MS/MS	*P. promelas*, NOEC (28 d) (growth)	3.2	32
		Taiwan	STP influent	738-2883	SPEHPLC–MS/MS	NOEC (21 d) (condition index)	1	32
		South Korea	River water	ND-690 (±26)	SPE-LC–MS/MS	*P. promelas*, LOEC (28 d) (growth)	10	32
	Metoprolol	Finland	STP influent	980-1350	SPEHPLC-MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	>100	155
		Sweden	STP influent	160	SPEHPLC-MS/MS	*D. subspicatus* EC_{50} (growth inhibition)	7.3	134
		Taiwan	STP influent	14-597	SPEHPLC-MS/MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	>320	155
	Sotalol	Finland	STP influent	640-830	SPEHPLC–MS/MS	-	-	83

		Germany	Ground water	560	SPEHPLC–MS/MS	-	-	83
	Propranolol	Sweden	STP influent	50	SPE-LC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	7.5	134
		Taiwan	Hospital effluent	54	SPEHPLC-MS/MS	*D. subspicatus* EC_{50} (growth inhibition)	5.8	155
		UK	STP influent	60-119	SPEHPLC-MS/MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	114	155
		Spain	Hospital effluent	200-6500	SPEHPLC-MS/MS	*T. platyurus* LC_{50} (24 h) (mortality)	10.31	147
		South Korea	River water	ND-40.1 (±3)	SPE-LC–MS/MS	*O. latipes*, LC_{50} (96 h)	11.40	147
Blood lipid lowering agents	Bezafibrate	Italy	River water	0.79-2.75	SPEHPLC-MS/MS	EC_{50} (96 h) (morphology)	25.85	152
		Italy	STP effluent	0.3-117	SPEHPLC–MS/MS	*D. magna*, EC50 (24 h) (immobilization)	100.08	102
		Brazil	River water	<25	SPE-GC–MS	*Hydra attenuata* LC_{50} (96 h) (morphology)	70.71	152

		Spain	STP effluent	40-130	SPE-LCQqLITMS	LOEC (96 h) (morphology)	1	152
	Clofibric acid	Brazil	Drinking water	<10-30	SPE-GC–MS	*D. subspicatus* EC_{50} (growth inhibition)	115	155
		Italy	River water	0.41-5.77	SPEHPLC-MS/MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	12.5	146
		UK	STP influent	<20-651	SPEHPLC-MS/MS	*S. subspicatus*, EC_{50} (72 h)	89	146
		Spain	STP influent	25-58	SPEHPLC-MS/MS	*D. magna*, EC_{50} (immobilization)	106	156
		Greece	STP influent	ND	SPE-GC–MS	*D. magna*, EC_{50} (48 h) (immobilization)	72	156
		Germany	Ground water	2-40	SPEHPLC-MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	>200	83
		Slovenia	Drinking water	<17	SPEHPLC-MS/MS		-	156
	Gemfibrozil	Canada	STP effluent	80.1-478.2	SPE-GC–MS/MS	*Hydra attenuata* LC_{50} (96 h) (morphology)	22.36	152

		Sweden	STP influent	710	SPE-GC–MS	LOEC (96 h) (morphology)	1	152
		USA	Drinking water	0.43	SPE-LC–MS/MS	NOEC (96 h) (morphology)	0.1	152
		China	River water	ND-22.4 (±3.1)	SPE-GC-NCI-MS	*A. fischeri*, EC_{50} (24 h) (bioluminescence)	64.6	157
		South Korea	STP effluent	3.9-17	SPE-LC–MS/MS	*A. fischeri*, EC_{50} (48 h) (bioluminescence)	45.1	157
		Spain	STP effluent	470-3550	SPE-LC-QqLITMS	*D. magna*, EC_{50} (48 h) (immobilization)	42.6	157
	Atorvastatin	USA	Drinking water	<0.25	SPE-LC–MS/MS	*L. gibba*, LOEC (7 d) (growth parameters)	0.3	158
		Canada	STP influent	76 (±3)	SPE-LC–MS/MS	-	-	158
	Lovastatin	Canada	STP influent	49 (±2)	SPE-LC–MS/MS	-	-	158
	Pravastatin	Canada	STP influent	117 (±6)	SPE-LC–MS/MS	-	-	158

	Simvastatin	Canada	STP influent	4 (±0)	SPE-LC–MS/MS	-	22.8	158
NSAIDs	Acetylsalicylic acid	Romania	River water	<30-37.2 (±4.6)	SPE-GC–MS	*D. subspicatus* EC_{50} (growth inhibition)	106.7	30,144 155,159
		Japan	STP influent	470-19,400	SPE-GC–MS	*D. magna,* EC_{50} (48 h) (immobilization)	88.1	159
	Salicylic acid	Canada	STP influent, River Water	554.3-2178.2, 130.4-371.5,	SPE-GC–MS/MS	*V. fischeri* EC_{50} (30 min)	90	133
	Diclofenac	Spain	STP influent	200-3600	SPE-GC–MS	*D. magna,* EC_{50} (48 h) (immobilization)	68	155
		Switzerland	STP influent	1300-2900	SPE-GC–MS	*D. subspicatus* EC_{50} (growth inhibition)	72	155
		Sweden	STP influent	160	SPE-GC–MS/MS	-	0.0005	134
		Brazil	Paraíba do Sul river	20-60	SPE-GC–MS/MS	*Dunaliellatertiolecta* EC50 (96 h) (growth inhibition)	185.69	83
		Canada	STP influent	32-448	SPE-GC–	*L. minor*, EC_{50} (7 d)	7.5	133

					MS/MS	(growth inhibition)		
		Greece	STP influent	12-560	SPE-GC–MS/MS	*O. mykiss,* LOEC (28 days), (cytological alterations)	0.001	134
		Germany	Groundwater	590	SPE-GC–MS	*D. subspicatus*, EC_{50} (growth inhibition)	71.9	159
		China	Pearl river	ND-147	GC-NCI-MS	LOEC (10 d) (survival)	8	30
		Taiwan	Hospital effluent	328	SPEHPLC–MS/MS	LOEC (96 h) (growth inhibition)	20	83
		USA	Drinking water	<0.25	SPE-LC–MS/MS	*P. subcapitata,* NOEC (96 h) (growth inhibition)	10	30
		UK	STP influent	901-1036	SPEHPLC-MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	22.43	30
	Fenoprofen	Japan	STP influent	9.68-80.6	SPE-GC–MS	-	-	159
	Ibuprofen	Spain	STP influent	34,000-168,000	SPE-GC–MS	*D. magna*, EC_{50} (48 h) (immobilization)	108	155
		Switzerland	STP influent	1750-4500	SPE-GC–MS	*D. subspicatus*	315	155

						EC_{50} (growth inhibition)		
		Canada	STP influent	2235.2-6718.3	SPE-GC–MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	22	155
		Brazil	Paraíba do Sul river	<10	SPE-GC–MS	LOEC (14 d) (population growth)	20	83
		Taiwan	Hospital effluent	119	SPEHPLC–MS/MS	*T. platyurus,* LC50 (24 h) (mortality)	19.59	83
		Sweden	STP influent	3590	SPE-GC–MS	NOEC (14 d) (survival)	20	134
		Italy	River water	78.50	SPEHPLC-MS/MS	*Gammarus pulex* LOEC (behaviour)	0.01	146
		USA	Ground water	3110	SPE-LC–MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	4.01	160
		UK	STP influent	7741-33,764	SPEHPLC-MS/MS	*O. latipes*, LC_{50} (96 h) (mortality)	>100	161
		South Korea	STP influent	10-137	SPE-LC–MS/MS	*Hydra attenuata* LC_{50} (96 h) (morphology)	22.36	155
		South Korea	Mankyung river water	<5–414 (±13)	SPE-LC–MS/MS	LOEC (96 h) (morphology)	1	155

		Germany	River water	8.7-32	SPE-GC–MS	NOEC (21 d) (survival)	5.36	161
		Luxembourg	STP influent	82-3080	SPE-LC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	101.2	83
		Romania	Somes river water	<30–115.2	SPE-GC–MS	EC_{50} (14 d) (reproduction)	13.4	83
	Carboxy-Ibuprofen	Sweden	STP influent	10750	SPE-GC–MS	-	-	83
		Germany	Elber river	11-32	SPE-GC–MS	-	-	83
	Hydroxy-Ibuprofen	Sweden	STP influent	990	SPE-GC–MS	-	-	83
		Germany	Elber river	32-101	SPE-GC–MS	-	-	83
	Indomethacin	Spain	STP effluent	160-390	SPE-LC-QqLITMS	*T. platyurus* LC_{50} (24 h) (mortality)	16.14	83
		Canada	STP influent	30-430	SPE-GC–MS	-	-	83
		South Korea	River water	<1-33.5	SPE-LC–MS/MS	*O. latipes* LC50 (96 h) (mortality)	81.92	83
	Ketoprofen	Canada	STP effluent	8-351	SPE-GC–MS/MS	-	-	133
		Sweden	STP effluent	940	SPE-GC–MS/MS	-	-	134

		Spain	STP effluent	131	SPE-GC–MS/MS	-	-	156
		Germany	River water	<26	SPE-GC–MS/MS	-	-	156
		USA	STP effluent	23 (±6.8%)	SPE-GC–MS	-	-	156
	Mefenamic acid	UK	STP influent	136-363	SPEHPLC-MS/MS	*T. platyurus* LC_{50} (24 h) (mortality)	3.95	147
		Japan	STP influent	4.45-396	SPE-GC–MS	*O. latipes* LC_{50} (96 h) (mortality)	8.04	147
		China	River water	ND-22.4 (±3.1)	GC-NCI-MS	-	-	147
		Spain	STP effluent	40-60	SPE-LCQqLITMS	-	-	147
	Naproxen	Canada	STP effluent	271.4-7962.3	SPE-GC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	174	133
		Sweden	STP influent	3650	SPE-GC–MS	*L. minor*, EC_{50} (7 d) (growth inhibition)	24.2	134
		USA	Drinking	<0.5	SPE-LC–	*T. platyurus*, LC_{50} (24 h)	84.09	162

			water		MS/MS			
		Spain	STP influent	109-455	SPEHPLC-MS/MS	*P. subcapitata*, EC_{50} (72 h) (growthinhibition)	31.82	162
		USA	River water	31 (±5.5%)	SPE-GC–MS	*B. calyciflorus*, EC_{50} (48 h) (growthinhibition)	0.56	162
		Brazil	Paraíba do Sul river	<10-50	SPE-GC–MS	*B. calyciflorus* LC50 (24 h)	62.48	162
		Taiwan	Hospital effluent	698	SPE-LC–MS/MS	*C. dubia,* EC_{50} (24 h) (immobilization)	66.37	162
		Japan	STP influent	38-230	SPE-GC–MS	*C. dubia,* EC_{50} (7 d) (population growth inhibition)	0.33	162
		China	Pearl river	ND-118	GC-NCI-MS	*D. subspicatus,* EC_{50} (growth inhibition)	625.5	83
		South Korea	STP effluent	20-483	SPE-LC–MS/MS	*D. magna*, EC_{50} (48h) (immobilization)	166.3	159
	Paracetamol	Spain	STP influent	29,000-246,000	SPE-GC–MS	*V. fischeri* EC_{50} (15min)	567.5	151
		USA	Ground	380	SPE-LC–MS	*D. magna*, EC_{50} (48 h)	30.1	151

			water			(immobilization)		
		UK	Surface water	<50	SPE-HPLC-MS/MS	*B. rerio (zebrafish)* LC_{50} (48 h)	378	83
		UK	STP influent	5529-69,570	SPE-HPLC-MS/MS	*O. latipes*, LC_{50} (48h)	>160	151
		Taiwan	Hospital effluent	62,250	SPEHPLC-MS/MS	*D. magna*, EC_{50} (96h) (immobilization)	26.6	151
		Serbia	Danube river	78170	SPE-LC–MS/MS	*A. fischeri* EC_{50} (30 min)	650	151
		South Korea	STP effluent	1.8-19	SPE-LC–MS/MS	*S. subspicatus*, EC_{50} (72 h)	134	151
Sex hormones	17α-Estradiol	USA	Surface water	30	LLE-GC–MS	-	-	144
		France	Ground water	0.8-3.5	SPE-LC–MS/MS	-	-	157
	17β-Estradiol	USA	Surface water	9	LLE-GC–MS	*O. latipes* NOEC (21 d)	<0.0293	144
		USA	Drinking water	<0.50	SPE-LC–MS/MS	LOEC (21 d) (testis-ova induction)	<0.0000293	83
		Japan	STP influent	13.3-25.8	SPE-GC–MS	-	-	33

		China	Rivers water	ND-7.5 (±0.4)	SPE-GC–MS	-	-	33
		South Korea	STP effluent	<1.0	SPE-LC–MS/MS	-	-	33
		Germany	STP influent	11.8 (±5.1)	SPE-LC–MS/MS	-	-	33
		Taiwan	Hospital effluent	25	SPE-HPLC–MS/MS	NOEC (21 d) (VTG induction)	0.0000293	83
		Italy	STP influent	10-31	SPE-LC–MS/MS			
		France	Groundwater	0.3-1.3	SPE-LC–MS/MS	-	-	33
	Estriol	USA	Surface water	19	LLE-GC–MS/MS	-	-	83
		Italy	STP influent	23-48	SPE-LC–MS/MS	-	-	83
		Japan	STP influent	83-255	SPE-GC–MS/MS	-	-	33
		South Korea	STP effluent	8.9-25	SPE-LC–	-	-	83

					MS/MS			
	Estrone	USA	Surface water	27	LLE-GC–MS/MS	-	-	83
		USA	Drinking water	<0.20	SPE-LC–MS/MS	-	-	83
		Japan	STP influent	28.7-197	SPE-GC–MS/MS	-	-	83
		Taiwan	Hospital effluent	126	SPE-HPLC–MS/MS	-	-	83
		China	Pearl river	ND-75	SPE-GC–MS/MS	-	-	83
		South Korea	STP effluent	2.2-36	SPE-LC–MS/MS	-	-	83
		Germany	STP influent	188(±92)	SPE-LC–MS/MS	-	-	83
		Italy	STP influent	15-60	SPE-LC–MS/MS	-	-	83
		France	Surface water	0.3	SPE-LC–	-	-	83

					MS/MS			
	17α-Ethinylestradiol	USA	Surface water	73	LLE-GC–MS	*P. promelas*, LOEC (21d) (plasma VTG induction)	0.000001	163
		USA	Drinking water	<1.0	SPE-LC–MS/MS	*P. promelas*, LOEC (21 d) (ultrastructure testes)	0.000001	163
		Germany	STP influent	8.8 (±8.0)	SPE-LC–MS/MS	-	-	163
		Taiwan	Hospital effluent	32	SPE-HPLC–MS/MS	LOEC (21 d) (ultrastructure liver)	0.000001	163
		Luxembourg	STP influent	2-24	SPE-LC–MS/MS	LOEC (21 d) (fertilization rate)	0.00001	163
		South Korea	STP effluent	1.3	SPE-LC–MS/MS	LOEC (38 dph) (plasma VTG induction)	0.000002	163
		Italy	STP influent	ND	SPE-LC–MS/MS	-	-	163
		France	Ground water	0.5-3.0	SPE-LC–MS/MS	-	-	164
X-ray contrast	Diatrizoate	Germany	STP effluent	250	SPE-LC–	-	-	83

media					MS/MS			
		Germany	Drinking water	1200	SPE-HPLC–MS	-	-	165
	Iohexol	Australia	STP influent	2800-4760	DI-LC–MS/MS	-	-	83
		Germany	Danube river	40-86	SPEHPLC–MS/MS			166
	Iopamidol	Germany	Ground water	300	SPEHPLC–MS/MS	-	-	83
		Australia	STP influent	400-620	DI-LC–MS/MS	-	-	83
		Germany	Danube river	210	SPEHPLC–MS/MS	-	-	166
	Iopromide	South Korea	STP effluent	1170-4030	SPE-LC–MS/MS	*D. magna*, EC_{50} (48 h) (immobilization)	>1000	83
		Germany	STP effluent	4400	SPE-LC–MS/MS	*A. fischeri* EC_{50} *(30min)*	>10,000	83
		Germany	Surface water	1600	SPE-HPLC–MS	-	-	165
		Australia	Ground water	168	SPE-LC-	*S. subspicatus*, EC_{50} (72	>10,000	83

					MS/MS	h) (growth inhibition)		
		Australia	STP effluent	430-1350	DI-LC–MS/MS	-	-	167
		USA	STP influent	ND-17	SPE-LC-MS/MS	*P. putida*, EC_{10} (16 h) (growth inhibition)	>10,000	83
		Spain	STP influent	6600	SPE-LC-MS/MS	*D. rerio*, NOEC (28 d)	>100	83
	Iomeprol	Australia	STP influent	<730	DI-LC-MS/MS	-	-	83
		Germany	STP effluent	370	SPE-LC-MS/MS	-	-	166
		Germany	Danube river	100-160	SPE-HPLC-MS/MS	-	-	166

[#]For references, see the main review article's reference section.

LOEC-lowest-observed-effect concentration; NOEC-No-observed-effect-concentration; STP-Sewage treatment plant; WWTP-Waste water treatment plants; SPE-Solid Phase Extraction; GC-MS-Gas Chromatography with Mass Spectrometry Detection; GC-MS/MS-Gas Chromatography with Tandem Mass Spectrometry Detection; GC-NCI-MS-Gas Chromatography-Negative Chemical Ionization-Mass Spectrometry; HPLC-MS/MS-High Performance Liquid Chromatography with Tandem Mass Spectrometry Detection; LC-QqLIT-MS-Liquid chromatography-quadrupole-linear ion trap-mass spectrometry detection; LC–MS/MS-Liquid Chromatography with Tandem Mass Spectrometry Detection; LC-FD-Liquid Chromatography with Fluorescence Detection; LC-MS-Liquid Chromatography with Mass Spectrometry Detection;

LLE-Liquid-Liquid Extraction; HF-LPME-Hollow Fibre Supported Liquid Phase Microextraction; HPLC–MS-High Performance Liquid Chromatography with Mass Spectrometry.

Table S2 Worldwide occurrence of PCPs in different sample type along with toxicity to specific species.

Class	Compound	Sample type	Concentration	Species/Endpoints	LC_{50} (mg/l)	Place	Ref.[#]
Bactericides/ Disinfectants	Triclosan (TCS)	STPI	892[a]	-	-	India (3 States)	177
		STPI	2300[a]	-	-	California, USA	5
		STPI	547[a]	-	-	Ulsan, Korea	220

		Marine biota	0.29-2.0[b] (ww)	*Valamugil buchanani, Mugil cephalus*	-	Philippines	206
		Marine biota	130-1385[b] (dw)	*Mytilus galloprovincialis*, Stripped venus	-	Greece (Aehean Sea)	221
		Marine biota	1.5 ± 0.2 [b](dw)	*Mytilus galloprovincialis*	-	Spain	222
		Marine biota	2.4 ± 0.7 [b](dw)	Mussels	-	South Australia	223
		Surface water	<0.5-1.7[a]		-	Antarctic	209
		Surface water	14-75[a]		-	China	209
		Surface water	944[a]		-	India	207
		Surface water	10-24,000[a]		-	UK	179
		Surface water	ND-105.8[a]		-	USA	16
		Ground water	12[a]		-	Canada	224
		Ground water	ND-<1000[a]		-	USA	160
		Experiment	-	*D. magna*, 48h survival	0.39	USA	181
		Experiment	-	*Pimephales promelas*, 24h survival	0.36	USA	181

		Experiment	-	*Bufowoodhousii*, 96h survival and physiology	0.152	USA	225
		Experiment	-	*Rana sphenocephala*. 96h survival and physiology	0.562	USA	225
	Triclocarbon (TCC)	STPI	1150[a]	-	-	India (3 States)	177
		STPI	540[a]	-	-	USA	226,227
		Marine biota	0.01-0.09[b] (ww)	*Valamugil buchanani*, *Mugil cephalus* (fish)	-	Philippines	206
		Marine biota	<0.6-1.5 (dw)	*Geukensia demissa*	-	San Francisco	228
		Marine biota	2.23-2.47 (dw)	*Holothuria tubulosa*	-	Spain	229
		Surface water	ND-75[a]	-	-	USA	16
		Surface water	<1.5/8-478[a]	-	-	China	14
		Ground water	19[a]	-	-	Canada	224
		Fresh water	-	*D. magna*, 48h	0.01	USA	185
		Fresh water	-	*Oncorhynchus mykiss*,	0.12	USA	185

				96h			
		Estuarine	-	*Mysidopsis bahia*, 72h growth	0.021	USA	185
Fragrances	Galaxolide (HHCB)	STPI	2560-4520[a]	-	-	Busan, Korea	230
		Marine biota	0.12 ± 0.11[b] (ww)	*Ariidae sp.; Pomadasys sp*.	-	Singapore	231
		Marine biota	5.61[b] (dw)	Flounder	-	Netherlands	232
		Marine biota	10.93-11.73[b] (dw)	*Mugil cephalus*	-	Portugal	232
		Marine biota	2.38-203[b] (ww)	*Perna viridis; Mytilus edulis*	-	Chinese Sea	233
		Marine biota	4.0-4.2[b] (ww)	*Mytilus edulis*	-	Massachusetts	234
		Surface water	3.5-32[a]	-	-	China	235
		Surface water	15-57[a]	-	-	Denmark	236
		Surface water	<84[a]	-	-	France	237
		Surface water	6-28[a]	-	-	UK	179
		Surface water	Nd–4.7 ± 2.5[a]	-	-	USA	189

		Ground water	24.9[a]	-	-	China	238
		Ground water	1-50[a]	-	-	France	239
		Experiment	-	*A. tonsa*, 48h	0.47	Germany	240
		Experiment	-	*D. rerio*, 96h survival	>0.67	Germany	240
	Toxalide (AHTN)	STPI	550-1210[a]	-	-	Busan, Korea	230
		Marine biota	3.62-5.75[b] (dw)	*Mugil cephalus*	-	Portugal	232
		Marine biota	0.044 ± 0.38[b] (ww)	*Ariidae sp.; Pomadasys sp.*	-	Singapore	231
		Marine biota	1.33-8.55[b] (ww)	*Perna viridis; Mytilus edulis*	-	Indian Ocean	233
		Marine biota	1.1-1.3[b] (ww)	*Mytilus edulis*	-	Massachusetts	234
		Surface water	2.3-26.7[a]	-	-	China	235
		Surface water	9-13[a]	-	-	Denmark	236
		Surface water	<32[a]	-	-	France	237
		Surface water	3-10[a]	-	-	UK	179
		Surface water	0.08-1.0 ± 1.8[a]	-	-	USA	226

		Ground water	19.6 ± 0.8[a]	-	-	China	238
		Ground water	1-50[a]	-	-	France	239
		Experiment	-	*D. rerio*, 96h Malformation	LOEC~0.1	Germany	240
		Experiment	-	*O. latipes*, 96h survival	1	Germany	240
Insect repellent	DEET	STPI	600-1200[a]	-	-	Beijing, China	195
		STPI	66[a]	-	-	Shanghai, China	198
		Surface water	<0.2-107[a]	-	-	China	180
		Surface water	36[a]	-	-	Japan	241
		Surface water	1.4-527[a]	-	-	Singapore	197
		Surface water	ND-1616.5[a]	-	-	USA	189
		Ground water	546[a]	-	-	China	242
		Ground water	9[a]	-	-	European Union	8
		Ground water	5.8-298.4[a]	-	-	Singapore	197
		Ground water	2.3-13,500[a]	-	-	USA	160
		Experiment	-	*D. magna*, 96h	108	Korea	22

		Experiment	-	*P. promelas*, 96h	110	USA	243
		Experiment	-	*Oncorhynchus mykiss*, 96h	71.3	USA	244
	1,4-dichlorobenzene	Experiment	-	*D. magna*, 48h immobilization	0.7	The Netherland	245
		Experiment	-	*Danio rerio*, 96h	2.1	Germany	246
		Experiment	-	*S. pannonicus*, 72h growth	31	The Netherland	245
Preservatives	Butylparaben (BuPB)	STPI	160-170[a]	-	-	Guangzhou, China	247
		Marine biota	9.48–31.08[b] (ww)	*Enhydra lutris nereis*	-	Washington	36
		Marine biota	0.003–0.2[b] (ww)	Pelagic and demersal fishes	-	Philippines	248
		Experiment	-	*T. thermophila*, 24h	5.3	France	201
		Experiment	-	*A. fisheri*, 30min illuminescence	2.8	France	201
		Experiment	-	*D. magna*, 48h mobility	6	France	201

		Surface water	<0.5-2.3[a]	-	-	Antarctic	209
		Surface water	<0.1-5.3[a]	-	-	China	5
		Surface water	<300-16,000[a]	-	-	UK	179
	Methylparaben (MPB)	STPI	290-10,000[a]	-	-	Northwest Spain	249
		STPI	36.8[a], 97.9[a]	-	-	New York, USA	23
		Marine biota	21.0-686[b] (ww)	*Enhydra lutris nereis*	-	Alaska	36
		Marine biota	11.2-44.3[b] (ww)	*Mugil cephalus; Sciaenops ocellatus*	-	Florida	205
		Marine biota	3.75-4.48[b] (ww)	*Valamugil buchanani; Mugil cephalus*	-	Philippines	206
		Marine biota	1.0-6.1[b] (ww)	*Trematomus bernachii*	-	Antarctica	209
		Marine biota	11.3±0.7[b] (dw)	*Mytilus galloprovincialis*	-	Italy	222
		Experiment	-	*T. thermophila*, 24h	54	France	201
		Experiment	-	*A. fisheri*, 30min illuminescence	10	France	201
		Experiment	-	*D. magna*, 48h mobility	21	France	201

		Surface water	<0.8-37.4[a]	-	-	Antarctica	209
		Surface water	3.43-22.8[a]	-	-	India	207
		Surface water	6-350,000[a]	-	-	UK	179
		Ground water	83.2[a]	-	-	China	238
	Propylparaben (PPB)	STPI	520-2800[a]	-	-	Northwest Spain	249
		Marine biota	2.20–3.47[b] (ww)	Pygmy sperm; *Stenella clymene*	-	Florida	205
		Marine biota	0.33-1.48[b] (ww)	*Valamugil buchanani; Mugil cephalus*	-	Philippines	206
		Marine biota	2.1–5.3[b] (dw)	*Sterichinus neumayeri*	-	Antarctica	209
		Marine biota	2.8 ± 0.01[b] (dw)	*Mytilus galloprovincialis*	-	Italy	222
		Experiment	-	*T. thermophila*, 24h	9.7	France	201
		Experiment	-	*A. fisheri*, 30min illuminescence	2.6	France	201
		Experiment	-	*D. magna*, 48h mobility	7	France	201
		Surface water	<0.8-3[a]	-	-	Antarctica	209

		Surface water	38.6-57[a]	-	-	India	207
		Surface water	6-22,000[a]	-	-	UK	179
		Ground water	22.5[a]	-	-	China	238
Sunscreen/ UV filters	2-Ethyl-hexyl-4-trimethoxy cinnamate (EHMC)	STPI	462[a]	-	-	Hong Kong	37
		Marine biota	0.85-51.2[b] (ww)	*Pontoporia blainvillei*	-	Brazil	250
		Marine biota	<30-36.9[b] (ww	*Gadusmorhua*	-	Norway	251
		Marine biota	4.1-12.7[b] (dw)	*Lutjanus stellatus*	-	Hong Kong	217
		Marine biota	18.5-1750[b] (dw	*Mytilus galloprovincialis*	-	Portugal	218
		Marine biota	6.5-43.5[b] (dw)	*Mytilus edulis*	-	France	252
		Surface water	150[a]	-	-	Germany	253
		Surface water	14-153[a]	-	-	Spain	254
		Ground water	35.31[a]	-	-	Spain	255
		Experiment	-	*D. magna*, 48h immobility	0.29	Switzerland	214
	4-Methyl-benzilidine-	STPI	169[a]	-	-	5 regions of Hong Kong	37

	camphor (4MBC)	Marine biota	11.6-17.1[b](ww)	*Pontoporia blainvillei; Sotalia guianensis*	-	Brazil	250
		Marine biota	<0.2-2.3[b] (dw)	*Trichiurus lepturus*	-	South China	256
		Surface water	<3.2-45.1[a]	-	-	Antarctic	209
		Surface water	235-2592[a]	-	-	Germany	257
		Surface water	17-140[a]	-	-	Spain	254
		Experiment	-	*D. magna*, 48h immobility	0.56	Switzerland	214
	Butyl methoxydibenzoyl methane (BMDM)	STPI	289[a]	-	-	Hong Kong	37
	Ethylhexyl salicylate (EHS)	STPI	93[a]	-	-	Hong Kong	37

	Homosalate (HMS)	STPI	151[a]	-	-	Hong Kong	37
	Isoamyl p-methoxy cinnamate (IAMC)	STPI	43[a]	-	-	Hong Kong	37
	Octyl dimethyl-p-aminobenzoic acid (ODPABA)	STPI	138[a]	-	-	Hong Kong	37
		Marine biota	4-52.5[b] (ww)	*Pontoporia blainvillei*	-	Brazil	250
		Marine biota	6.4-10.3[b] (dw)	*Lutjanus stellatus*	-	Hong Kong	217
		Marine biota	3-800[b] (dw)	*Mytilus galloprovincialis*	-	Portugal	218
	Octocrylene (OC)	STPI	8[a]	-	-	Hong Kong	37
		Marine biota	42.9-77.6[b](ww)	*Pontoporia blainvillei*	-	Brazil	250
		Marine biota	<20-11,875[b] (ww)	*Gadus morhua*	-	Norway	251
		Marine biota	4.7-5.4[b] (dw)	*Lutjanus stellatus*	-	Hong Kong	217

		Marine biota	22.0-3950[b](dw)	*Mytilus galloprovincialis*	-	Portugal	218
		Surface water	13-283[a]	-	-	Spain	254
		Ground water	8.42[a]	-	-	Spain	255
	Oxycodone (OXB)	STPI	41.84[a]	-	-	India (3 States)	177

[#]For references, see the main review article's reference section. [a]Concentration in (ng/l), [b]Concentration in (ng/g), dw-Dry weight, ww-Wet weight, ND-Not detectable, STPI-Sewage Treatment Plant Influent, LOEC-lowest-observed-effect concentration.