

1 **Supplementary Materials**

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3 **Table S1.** Classification of PPCPs Analyzed by Usage with Detailed QA/QC Information

Usage	PPCPs	Recovery rate (%)	LOD	LOQ	R ² of Calibration Curve
Antimicrobials	Ciprofloxacin	89.6	0.30	1.05	0.997
	Diclazuril	68.9	0.43	1.42	0.997
	Enrofloxacin	75.0	0.05	0.16	0.978
	Levofloxacin	81.8	0.38	1.30	0.995
	Nalidixic acid	92.2	0.09	0.30	0.993
	Norfloxacin	96.1	0.15	0.49	0.996
	Sulfadimethoxine	92.2	0.06	0.20	0.989
	Sulfadimidine	96.0	0.10	0.35	0.991
	Sulfamerazine	95.5	0.20	0.66	0.996
	Sulfamethoxazole	63.2	0.16	0.54	0.990
	Sulfamonomethoxine	94.0	0.48	1.67	0.990
	Sulfapyridine	96.4	0.10	0.33	0.994
	Sulfathiazole	97.1	1.27	4.18	0.994
	Triclocarban	84.9	0.16	0.49	0.999
	Triclosan	78.5	0.20	0.62	0.990
Trimethoprim	91.1	0.11	0.36	0.994	
Antibiotics	Azithromycin	57.2	0.06	0.19	0.999
	Chlortetracycline	89.3	0.20	0.78	0.997
	Clarithromycin	69.8	0.18	0.59	0.994
	Lincomycin	95.8	0.15	0.48	0.995
	Oxytetracycline	88.9	0.20	0.65	0.991
	Roxithromycin	84.9	0.07	0.25	0.998
	Tetracycline	98.1	0.02	0.08	0.996
	Thiamphenicol	73.1	0.20	1.04	0.994
	Tiamulin	95.0	0.03	0.10	0.993
Tylosin	86.1	0.07	0.23	0.999	
Antipyretic analgesics	Acetaminophen	94.5	0.24	0.79	0.990
	Antipyrine	89.9	0.11	0.35	0.992

	Diclofenac	94.0	0.68	2.08	0.999
	Ethenzamide	83.9	0.09	0.28	0.988
	Fenoprofen	86.9	0.57	1.81	0.995
	Indomethacin	88.3	0.19	0.65	0.997
	Isopropylantipyrine	94.9	0.04	0.13	0.988
	Ketoprofen	95.0	0.48	1.70	0.995
	Mefenamic acid	91.1	0.29	0.96	0.999
	Naproxen	88.1	0.25	0.88	0.996
Antiarrhythmics	Atenolol	95.6	0.42	1.40	0.995
	Disopyramide	94.6	0.06	0.18	0.999
	Metoprolol	63.9	0.12	0.40	0.978
	Propranolol	95.0	0.06	0.20	0.991
Bronchodilators	Clenbuterol	95.5	0.20	0.70	0.999
	Salbutamol	97.0	0.34	1.07	0.998
	Theophylline	98.0	0.22	0.70	0.994
Angina pectoris drugs	Diltiazem	97.0	0.02	0.05	0.995
	Dipyridamole	95.8	0.04	0.13	0.995
Antiepileptics	Carbamazepine	89.9	0.05	0.16	0.971
	Primidone	79.7	1.08	3.41	0.982
Antilipemics	Bezafibrate	87.3	0.34	1.21	0.999
	Clofibric acid	92.0	0.14	0.43	0.995
Carbadox metabolite	2-Quinoxaline carboxylic acid	76.1	0.32	0.98	0.996
Cardiotonic agents	Caffeine	66.7	0.14	0.48	0.975
Antipruritics	Crotamiton	97.9	0.07	0.24	0.986
Anticancer drugs	Cyclophosphamide	91.8	0.19	0.66	0.989
Repellents	DEET	65.0	0.03	0.11	0.983
Diuretics	Furosemide	92.5	0.19	0.61	0.997
Antifungal agents	Griseofulvin	94.6	0.17	0.56	0.991
Inhibitor of NMDA receptor	Ifenprodil	88.1	0.07	0.22	0.989
Peptic ulcer	Pirenzepine	81.5	1.05	3.61	0.995

agents					
Antipsychotics	Sulpiride	72.6	0.02	0.05	0.991

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2 **Table S2.** The Standard Deviations of the PPCPs in Secondary Treated Sewage Water with the
3 Physicochemical Information and Their Abbreviations

PPCPs	Secondary effluent (ng/L)		Abbr.	Log K _{ow}	pKa
	Concentration	Standard deviation			
Acetaminophen	3.7	1.1	Ace	0.46	9.38
Antipyrine	1.3	0.5	Ant	0.38	1.4
Atenolol	7.4	1.8	Ate	0.16	9.6
Azithromycin	6.4	0.6	Azi	4.02	8.74
Bezafibrate	67.9	58.3	Bez	3.97	3.83
Caffeine	20.0	15.3	Caf	-0.07	14
Carbamazepine	30.5	2.8	Car	2.45	13.9
Ciprofloxacin	2.5	1.0	Cip	0.28	6.09
Clarithromycin	30.8	10.4	Cla	3.16	8.99
Crotamiton	84.4	25.4	Cro	3.09	-0.6
DEET	11.9	10.8	DEE	2.02	-0.95
Diclofenac	29.1	2.6	Dic	4.51	4.15
Diltiazem	8.1	0.7	Dil	2.07	8.06
Furosemide	7.8	1.6	Fur	2.03	3.9
Isopropylantipyrine	2.4	0.2	Ipp	0.38	1.4
Ketoprofen	24.4	7.3	Ket	3.12	4.45
Levofloxacin	64.3	35.4	Lev	-0.39	6.25
Lincomycin	68.6	37.7	Lin	0.2	7.6
Mefenamic acid	24.0	23.6	Mef	5.12	4.2
Metoprolol	2.3	1.8	Met	1.88	9.7
Propranolol	10.8	1.0	Ppo	3.48	9.42
Roxithromycin	49.6	5.0	Rox	3.00	12.5
Sulfamethoxazole	12.3	12.3	Smz	0.89	1.6
Sulfapyridine	40.6	5.5	Spy	0.35	8.43
Sulpiride	154.8	13.5	Spi	0.57	9.12
Triclosan	29.6	27.2	Tcl	4.76	7.9

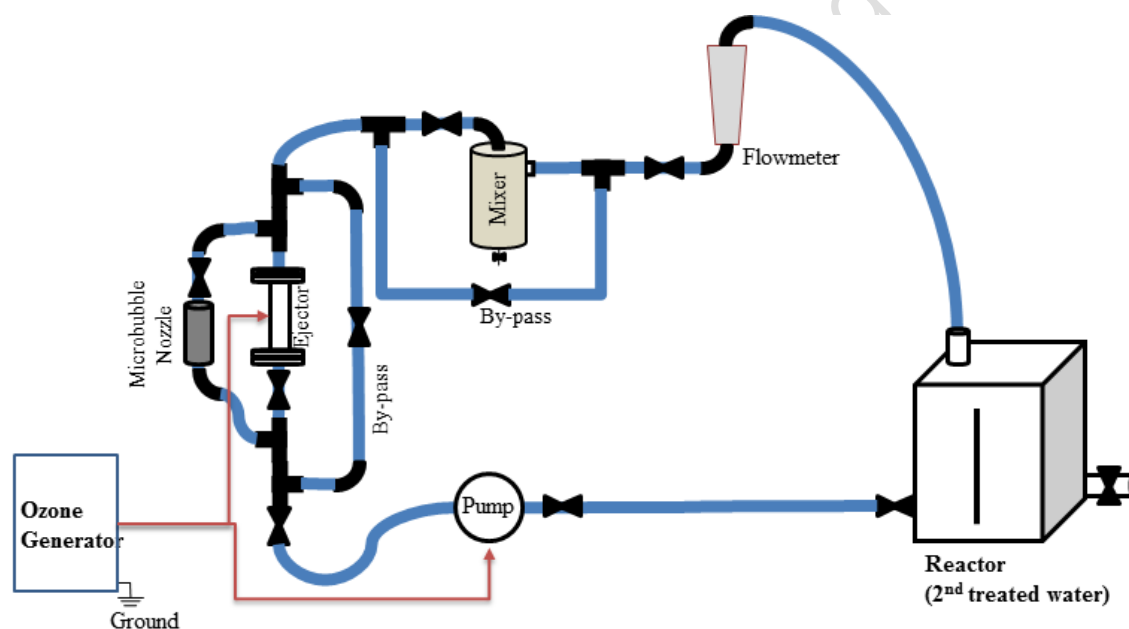
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1 **Table S3.** Toxic Information of PPCPs over the Reference Toxic Concentration

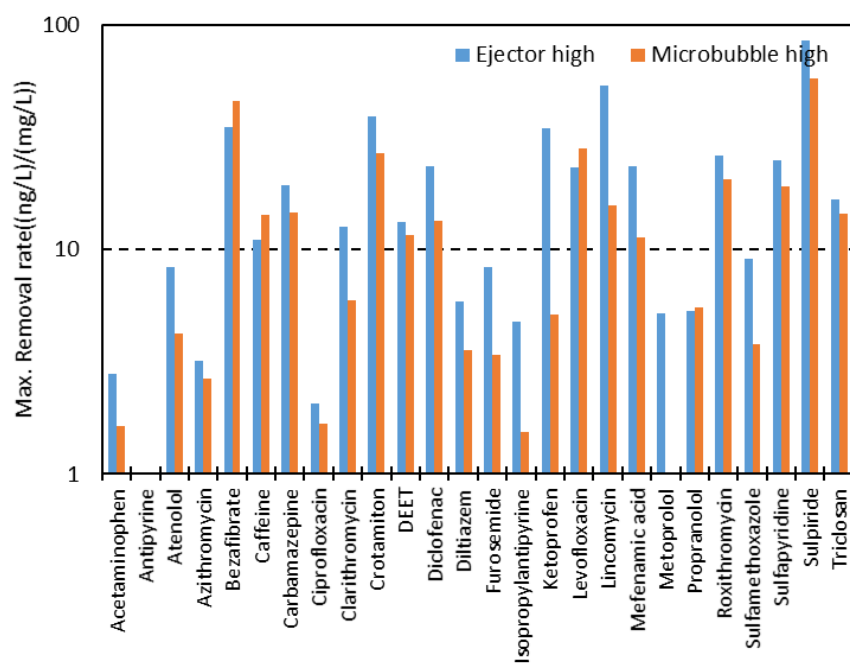
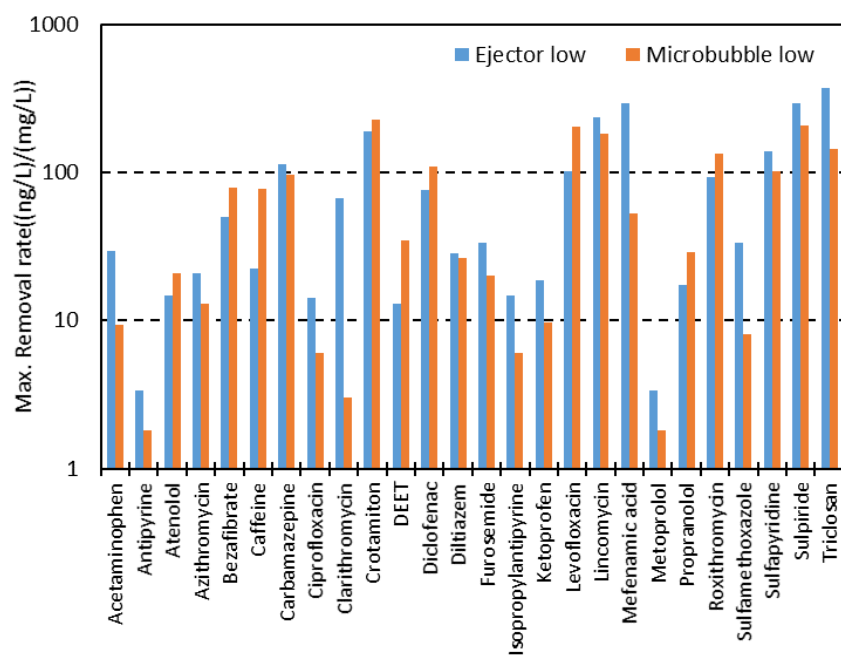
Name	Conc. ng/L	Ratio by the reference toxic value	Toxicological Effects Oral LD50 (mg/kg, mouse)	Chronic Toxicological
triclosan	29.6	2.347	4,530	drug, mutagen, primary irritant, reproductive effector
bezafibrate	67.9	1.985	723	reproductive effector
mefenamic acid	24.0	0.761	525	drug, reproductive effector, tumorigen

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4 **Fig. S1.** Scheme of ozone dissolution set of ejector and microbubble.



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Fig. S2. Max elimination rate in ejector and microbubble. (a) Low concentration, (b) High concentration.