

Supplementary material

Novel metabolomic method to assess the effect-based removal efficiency of advanced wastewater treatment techniques

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Additional information on exposure set-up:

Larvae were exposed individually in small aquaria (10x10x10 cm) containing 100 mL of the wastewater or tap water, respectively. The water was not replaced during the 7 days exposure period. Aquaria filled with conventionally treated effluent contained minor sediments, whereas aquaria filled with ozonated effluent, biochar filtered effluent and tap water did not contain any visible sediments. Larvae were fed with zooplankton cultivated at Umeå University directly after collection and transport to the lab, but not during or after the exposure. Larvae had all reached larval stage (or instar) F-3 before exposure. Instar F represents the final instar (i.e. the instar that emerges to adult) and F-1 is the instar before that and so on. This is the common way that scientists refer to the stage of development of both dragon-and damselfly larvae.

Normalized peak areas of all samples:

Table S1. Peak areas of oxylipins (normalized against internal standard areas and sample weight) detected in damselfly larvae exposed to conventionally treated effluent (E), effluent additionally treated with ozone (E+O), effluent additionally treated with biochar filtration (E+B), and tap water (control, C).

Exposure	12-HETE	13-HODE	14,15-DIHETE	8-HETE	9-HOTrE	9,10,13-TriHOME	9-HODE	17,18-DIHETE	5-HEPE	14,15-DiHETrE	11,12-DIHETE	15,16-DiHODE	12,13-DiHOME	9,12,13-TriHOME	13-HOTrE	9,10-DiHOME	11-HETE	5-HETE	9,10-DiHODE	8,9-DIHETE	11,12-DiHETrE	12,13-DiHODE	15(16)-EpODE	8,9-DiHETrE
E 1	12	5.6	21	200	32	5.2	8.5	90	4.2	9.1	12	110	16	2.2	6.7	12	2.8	1.5	5.7	3.3	5.7	2.6	5.2	2.3
E 2	23	4.4	67	370	43	3.4	9.2	110	5.9	23	42	74	27	1.9	7.4	23	3.3	1.8	11	9.2	14	6	4.8	4.3
E 3	14	5.5	30	250	23	2.9	8.5	40	6.7	9.9	22	16	11	1.4	4.6	11	3.5	2.5	3.8	5.9	7.8	0	0	3.6
E 4	29	7.3	36	440	36	4.5	11	48	10	13	23	20	14	2.2	7.5	16	5.7	4.1	5.4	7	10	0	0	2.9
E 5	29	3.4	20	290	35	2.7	7.2	48	5.1	8	13	42	8.4	1.3	7.3	7.3	3.3	2.5	2.8	3.4	5.3	0	2.3	2.1
E 6	14	3.6	26	140	26	2	4.9	60	4	9.4	16	50	12	0.91	5.2	10	2.4	1.8	5.5	4.2	6.6	2.4	2	2.6
E 7	20	10	19	710	34	6.2	17	18	11	7.5	10	14	12	2.5	9.2	11	5	4.5	0	0	4.9	0	0	0
E 8	9.9	4.9	27	230	23	3.1	7.3	19	4	7.5	17	4	9.6	1.5	5.4	11	2.6	1.5	5.5	4.4	5	1.9	0	1.9
E 9	9.2	3.2	20	210	29	2.9	5.8	53	3.5	7.9	13	73	10	1.3	5.5	9.7	1.6	1.1	5.2	4.4	4.3	2.7	2.8	1.5
E 10	22	8.7	38	320	59	5.9	17	82	5.2	14	22	130	26	2	12	25	2.5	1.9	11	5.5	7.9	5.3	6.7	2.5
E 11	7.4	2.4	10	240	13	1.9	4.7	10	1.5	3.4	5.5	2	3.4	0.63	2.9	3.6	0.72	0.37	1.9	0	1.6	0	0	0
E 12	9.6	4.4	8.7	590	17	3.6	8.8	11	1.9	2.7	5.7	6	4.5	1.4	2.9	4.1	1.5	0.78	0	0	0	0	0	0
E 13	7.2	3.8	18	450	22	2.8	7.7	19	2.9	5.3	10	15	6.6	1.3	5.3	5.1	1.6	1.1	2.2	1.8	3.4	0	2.2	0

Exposure	12-HETE	13-HODE	14,15-DIHETE	8-HETE	9-HOTE	9,10,13-TriHOME	9-HODE	17,18-DIHETE	5-HEPE	14,15-DIHETE	11,12-DIHETE	15,16-DIHOME	12,13-DIHOME	9,12,13-TriHOME	13-HOTE	9,10-DIHOME	11-HETE	5-HETE	9,10-DIHOME	8,9-DIHETE	11,12-DIHETE	12,13-DIHOME	15(16)-EPODE	8,9-DIHETE
E+O 18	7.6	5.9	7.5	420	15	3.4	7.2	8.4	4	2.8	4.5	5.4	4.6	1.8	3.6	0	3.3	1.3	0	0	0	0	0	0
E+O 19	6.9	3.7	6.7	530	29	3.1	8.4	5.6	1.7	2.3	3.4	4.8	3.3	1.3	6.4	3.1	0	0.69	0	0	0	0	0	0
E+O 20	5.6	3.5	5.2	600	17	2.8	7.5	4.5	0	1.7	3.3	2.6	3.4	1.1	3.7	2.8	0	0	0	0	0	0	0	0
E+O 21	5.2	4.3	3.6	440	17	2.8	8.5	4.3	2.5	1.7	0	5.2	2.7	1.3	4.2	2.5	1.9	2.1	0	0	0	0	0	0
E+B 1	50	13	25	600	44	12	18	69	11	15	20	67	23	5.1	9.3	19	8.4	6.3	0	0	8.8	0	0	0
E+B 2	18	6.4	26	350	45	3.4	10	29	6	8.4	14	22	9.8	1.5	9.1	10	2.4	2.4	6	5	5.7	2.8	0	2.8
E+B 3	17	6.8	29	270	25	3.7	9.2	59	6.1	14	25	36	14	1.9	6.3	15	4	2.5	6.6	6.4	11	0	0	0
E+B 4	18	7.6	16	510	28	3.4	12	14	5.9	7.8	11	15	12	1.7	6.2	9.7	4.3	3.5	3	3.5	4.9	0	0	0
E+B 5	12	4.9	12	230	16	3.2	6.5	24	6.8	5.7	8.1	16	5.6	1.4	3.1	5.3	4.2	2.8	0	0	3.6	0	0	0
E+B 6	9.7	7.1	23	150	29	3.1	7.8	73	8.8	9.9	15	97	14	2.1	7.3	11	4.3	3.9	9.4	5	4.6	6.2	7	0
E+B 7	9.8	5.7	18	260	21	4.1	9.7	38	4.6	8.8	14	30	10	1.7	5.1	9.3	1.8	2.2	3.5	0	5.8	0	2.4	0
E+B 8	8.4	4.6	3.8	260	18	4.2	7.3	4.9	6.1	1.6	0	7.8	2.7	1.4	3.7	3.6	2.4	3	0	0	0	0	0	0
E+B 9	14	6.5	9	470	15	4.9	10	7.4	4.7	3.7	4.6	5.1	4.6	2.5	2.6	4.1	5	2.7	0	0	0	0	0	0
E+B 10	17	6.8	22	480	43	5.7	14	48	6.9	11	19	61	14	2.5	8.4	13	2.9	2.3	7.7	0	8.6	2.6	3.4	2.5
E+B 11	16	5.4	7.5	230	18	4.7	8.9	38	5.2	4.6	5.8	37	11	2.1	3.2	6.3	3.8	2.6	0	0	0	0	0	0
E+B 12	25	15	21	410	36	10	18	70	14	12	17	81	21	4.8	7.5	18	12	7	6.7	0	8.6	0	4	0
E+B 13	7.6	7.8	6.7	390	26	4.4	10	7.4	1.8	3.6	4.2	9.3	5.5	2.6	6.3	6.2	4.4	5.2	1.8	0	3.7	0	1.5	1.6
E+B 14	4.5	3.4	9.6	260	18	2.5	4.8	15	2	3.6	8.8	20	5.6	1.2	2.7	4.9	1.5	0	3.6	0	0	0	2.7	0
E+B 15	7.8	3.3	6.5	400	17	3.5	7.3	7.5	2.1	1.9	4.4	2.2	4	1.2	4.1	4.1	1.3	0	0	0	0	0	0	0
E+B 16	4.6	2.7	3.4	250	14	2	4.5	6.2	1.6	1.1	2.5	5.1	2.3	0.99	3.6	2.5	1.4	0	0	0	0	0	0	0
E+B 17	11	5.9	18	510	34	3.7	11	18	2.4	6.2	12	18	8.8	1.5	8	7.8	1.6	0	4.3	0	3.6	0	3.1	0
E+B 18	3.8	3.4	2	280	8.1	2.5	5.1	3	1.3	1.4	0	1.8	2.1	1.2	0	2.3	2.6	2.5	0	0	0	0	0	0
E+B 19	7.6	4.7	4.9	600	24	5.4	7.5	6.5	1.8	2.4	0	6.2	0	2.8	8	0	1.5	0	0	0	0	0	0	0
E+B 20	11	4.8	5.3	840	30	4.8	10	5.8	2.6	1.8	0	0	3.5	2.4	6.4	0	1.5	0	0	0	0	0	0	0
E+B 21	11	7.6	13	740	28	5.5	14	9.7	4.3	3.2	7.3	5.7	6.6	2.1	6.5	4.7	2.5	0	0	0	0	0	0	0

Exposure	12-HETE	13-HODE	14,15-DiHETE	8-HETE	9-HOTrE	9,10,13-TriHOME	9-HODE	17,18-DiHETE	5-HEPE	14,15-DiHETrE	11,12-DiHETE	15,16-DiHODE	12,13-DiHOME	9,12,13-TriHOME	13-HOTrE	9,10-DiHOME	11-HETE	5-HETE	9,10-DiHODE	8,9-DiHETE	11,12-DiHETrE	12,13-DiHODE	15(16)-EpODE	8,9-DiHETrE
E+B 22	5.3	3.6	2.6	420	9	3	5.3	3.5	2.5	1	0	2.1	2.3	0	2.1	0	1.1	0	0	0	0	0	0	0
C 1	20	5.6	33	470	44	5.5	12	65	6	13	24	59	16	2.4	7.6	15	3.3	2.5	6.3	7.1	9.2	3.1	3.1	3.2
C 2	22	5.8	26	320	31	3.5	11	34	4.6	9.2	19	15	13	1.5	6.3	11	3.1	1.5	3.3	4	6.3	0	1.5	1.9
C 3	13	4.6	21	250	27	3.8	8.3	55	2.4	9.8	11	62	11	1.7	4.9	9.7	2.9	1.5	4.5	2.9	5.1	1.9	3.8	2.4
C 4	25	5.4	31	440	33	3.8	9.6	43	7.1	14	21	30	13	1.8	8	13	4.9	3.4	4.3	7.7	10	0	0	3.3
C 5	6.4	3.1	27	120	26	2.2	5.5	88	3.1	10	17	240	27	1.1	5.6	21	1.3	1.2	12	5	6.3	6.4	9.5	2.2
C 6	37	7.3	47	540	35	5	15	61	8.4	20	32	30	27	2.1	10	26	5.2	3	9.6	7.7	14	3.4	0	4.7
C 7	13	4.5	24	390	34	4.6	10	42	3.3	9.6	16	53	9.6	2.3	7	8.1	1.7	0	4.3	0	6.5	0	0	0
C 8	19	7.4	17	500	38	4.6	13	36	7.4	7.7	11	42	11	2.2	8.4	11	5.1	4.9	3.3	0	6	0	4.3	0
C 9	13	7.7	22	370	49	5.8	15	57	7	8.8	14	100	19	2.4	10	13	3.1	2.4	6.8	0	6.3	3	6.6	0
C 10	28	7.8	10	480	47	10	16	30	8.7	4.2	8.8	19	5.7	2.7	8.2	6.6	3.5	3.3	1.6	0	2.9	0	0	0
C 11	10	3.5	18	180	12	3.7	6.5	38	2.9	7.6	11	26	8	1.5	2.9	7.1	2.2	1.2	1.7	2.4	4.8	0	1.7	1.9
C 12	6.3	6.1	8.3	500	34	5.2	12	18	2.4	3.5	6	18	7.6	2	7.1	5.8	1.5	0	0	0	0	0	0	0
C 13	6.6	4.4	13	590	42	3.9	12	16	0	4.4	9.4	21	8	0	9.3	6	0.65	0	3.4	3.6	3.9	0	3.7	0
C 14	11	7.4	35	650	57	6.7	16	32	2.4	9.9	18	36	22	2.7	9.5	20	1.2	0	11	5.9	6.3	3.3	4.7	0
C 15	8.3	5	6.3	560	27	3	10	4.6	1.9	1.7	4	4.3	3.5	1.6	4.8	2.5	1.4	0	0	0	0	0	0	0
C 16	12	7.3	16	110	55	5.6	15	13	3.9	4.3	7.7	11	6.9	2.2	13	5.9	1.1	0	0	0	0	0	0	0
C 17	7.4	3.5	5.3	520	21	3.8	7	4.7	0	1.6	3.5	4.7	3	0	4.6	0	0.6	0	0	0	0	0	0	0
C 18	4.1	2.3	4.4	310	10	1.8	4.7	5.3	0	1.2	2.9	2.9	1.9	0.93	2.7	1.6	0.31	0	0	0	0	0	0	0

Included in the analysis but not detected in any of the samples:

10(11)-EpDPE, 10,11-DiHDPE, 11(12)-EpETE, 11(12)-EpETrE, 11,12-,15-TriHETrE, 12(13)-EpODE, 12(13)-EpOME, 12-HETE, 12-oxo-ETE, 13(14)-EpDPE, 13,14-DiHDPE, 13-oxo-ODE, 14(15)-EpETE, 14(15)-EpETrE, 15(S)-HETrE, 15-deoxy-PGJ2, 15-HEPE, 15-HETE, 15-oxo-ETE, 16(17)-EpDPE, 16,17-DiHDPE, 17(18)-EpETE,

17-HdoHE, 19(20)-EpDPE, 19,20-DiHDPE, 20-COOH-LTB4, 20-HETE, 20-OH-LTB4, 4,5-DiHDPE, 5(6)-EpETrE, 5,15-DiHETE, 5,6-DiHETE, 5,6-DiHETrE, 5-oxo-ETE, 6-keto-PGF1a, 6-trans-LTB4, 7(8)-EpDPE, 7,8-DiHDPE, 8(9)-EpETE, 8(9)-EpETrE, 8,15-DiHETE, 8-HEPE, 9(10)-EpODE, 9(10)-EpOME, 9-HETE, 9-oxo-ODE, EKODE, LTB3, LTB4, LTB5, LXA4, PGB2, PGD1, PGD2, PGD3, PGE1, PGE2, PGE3, PGF2a, PGJ2, Resolvin E1, THF diol, TXB2.