Supplementary Information

Impact of ozonation and biological post-treatment of municipal wastewater on microbiological quality parameters

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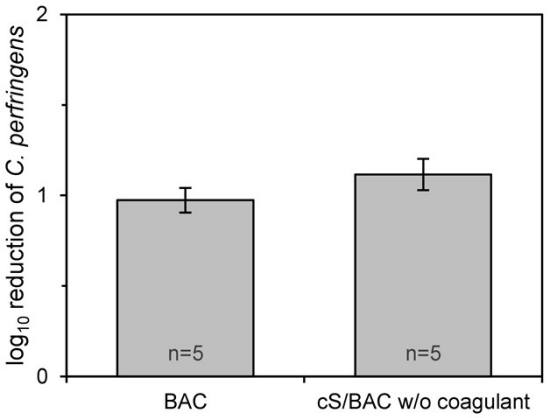

Fig. S1: Mean values with standard deviation of the $\log_{10}$ reduction for *C. perfringens* in the BAC filter and the cS/BAC filter without coagulant dosing. n is the number of analysed samples.

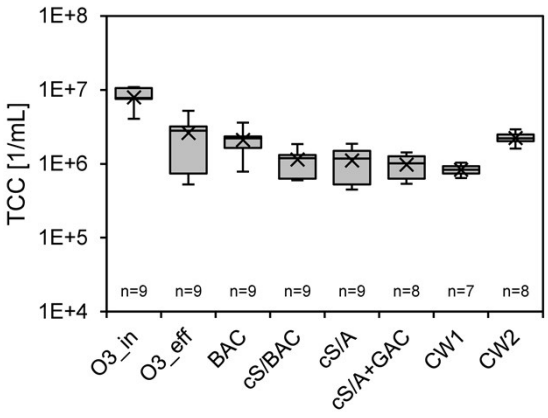

Fig. S2: Box-whisker-plot of TCC concentrations before and after ozonation and after post-treatment steps. n is the number of analysed samples.

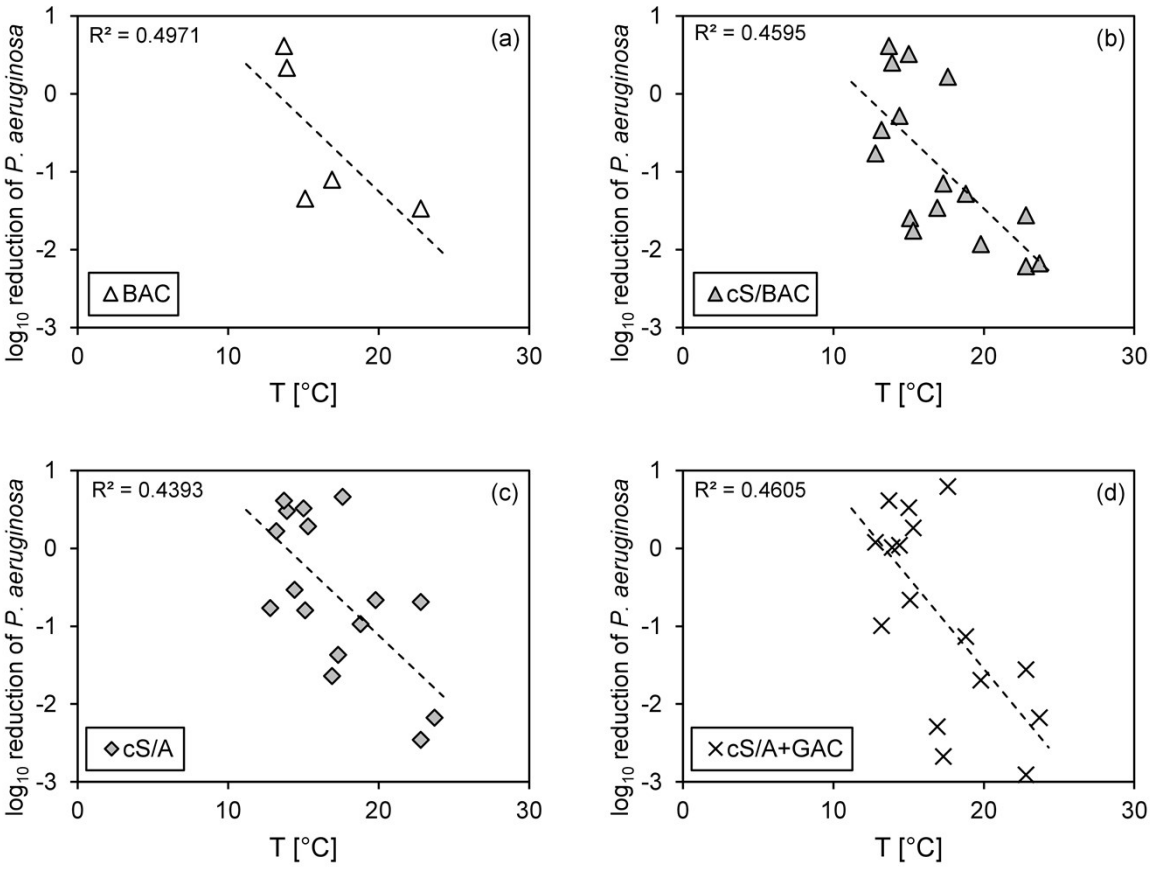

Fig. S3: Temperature dependence of the $\log_{10}$ reduction of *P. aeruginosa* in the post-treatments (a) BAC, (b) cS/BAC, (c) cS/A and (d) cS/A+GAC.

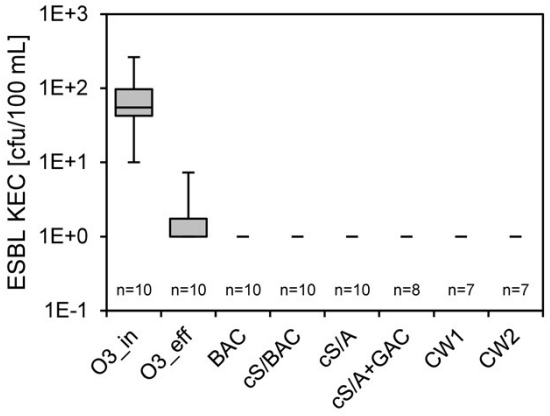

Fig. S4: Box-whisker-plot of ESBL KEC concentrations before and after ozonation and after post-treatment steps. n is the number of analysed samples.

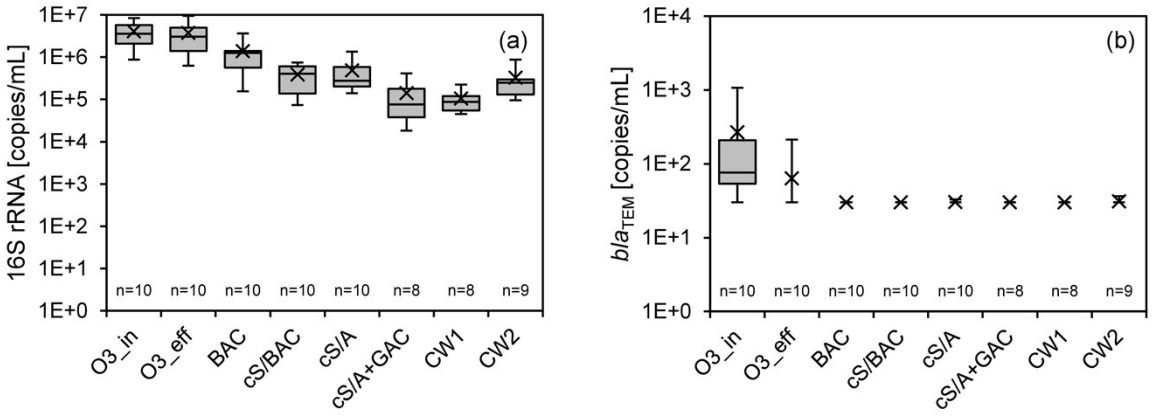

Fig. S5: Box-whisker-plots of (a) 16S rRNA and (b) bla_{TEM} concentrations before and after ozonation and after post-treatment steps. n is the number of analysed samples.

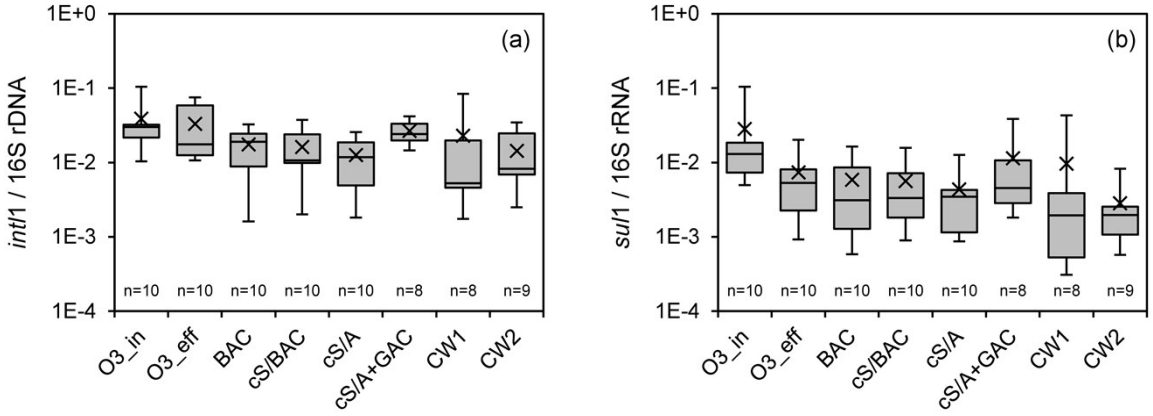

Fig. S6: Box-whisker-plots of the relative abundances (a) *intI*1/16S rRNA and (b) *sul1*/16S rRNA before and after ozonation and after post-treatment steps. n is the number of analysed samples.

Table S1: Number of samples (n) and number of samples below the limit of quantification (<LOQ) for all parameters and sampling points.

Parameter	Number	O3_in	O3_eff	BAC	cS/BAC	cS/A	cS/A+GAC	CW1	CW2
E. coli	n	32	32	21	33	33	30	14	14
	<LOQ	0	2	0	8	7	13	12	8
Enterococci	n	32	32	21	33	33	30	14	14
	<LOQ	0	1	10	30	26	25	11	8
C. perfringens	n	19	21	20	23	23	21	13	13
	<LOQ	0	0	0	2	3	1	8	2
Somatic coliphages	n	23	23	21	24	24	21	13	13
	<LOQ	0	0	2	5	1	2	10	6
P. aeruginosa	n	16	16	5	17	17	17		
	<LOQ	0	1	0	0	0	0		
TCC	n	9	9	9	9	9	8	7	8
	<LOQ	0	0	0	0	0	0	0	0
ICC	n	9	9	9	9	9	8	7	8
	<LOQ	0	0	0	0	0	0	0	0
*intI*1	n	10	10	10	10	10	8	8	9
	<LOQ	0	0	0	0	0	0	0	0
*sul*1	n	10	10	10	10	10	8	8	9
	<LOQ	0	0	0	0	0	0	0	0
16S rRNA	n	10	10	10	10	10	8	8	9
	<LOQ	0	0	0	0	0	0	0	0
bla_{TEM}	n	10	10	10	10	10	8	8	9
	<LOQ	0	8	9	9	9	8	8	8
ESBL *E. coli*	n	10	10	10	10	10	8	7	7
	<LOQ	0	1	6	6	7	8	6	7
VRE	n	10	10	10	10	10	8	7	7
	<LOQ	0	5	8	10	9	7	7	6
ESBL KEC	n	10	10	10	10	10	8	7	7
	<LOQ	0	3	8	8	9	8	7	7

Table S2: Results (p-values) for statistical analysis of log_{10} reduction comparison of the different treatments with oneway-ANOVA followed by Tukey post hoc test or Kruskal-Wallis followed by Dunn-Bonferoni post hoc test, respectively. Significant differences ($p<0.05$) are marked in grey.

Parameter	*E. coli*	Enterococci	*C. perfringens*	Somatic coliphages	*P. aeruginosa*	ICC	TCC	16S rRNA	*intI1*	*sul1*	ESBL *E. coli*	VRE	ESBL KEC
Statistical Test	Kruskal-Wallis	Kruskal-Wallis	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis
Comparison	p-values (<0.05 marked in grey)												
O3 – O3.BAC	1.00E+00	6.70E-03	5.65E-06	3.42E-14	7.49E-01	2.47E-09	1.00E+00	6.11E-02	8.38E-03	2.80E-01	1.00E+00	1.00E+00	1.00E+00
O3 – O3.cS.BAC	3.26E-01	3.44E-06	6.45E-14	<1.00E-14	1.45E-02	5.23E-07	9.80E-03	1.28E-06	1.01E-06	4.29E-03	4.92E-01	1.00E+00	1.00E+00
O3 – O3.cS.A	1.21E-01	5.13E-05	9.14E-14	<1.00E-14	2.59E-01	3.15E-06	2.43E-03	9.61E-06	8.01E-07	3.39E-03	6.15E-01	1.00E+00	1.00E+00
O3 – O3.cS.A.GAC	1.80E-04	2.21E-06	8.69E-14	<1.00E-14	2.86E-02	7.70E-09	2.40E-03	3.23E-11	4.87E-08	1.48E-04	3.35E-01	1.00E+00	1.00E+00
O3 – O3.CW1	7.28E-03	9.14E-03	4.12E-14	<1.00E-14		2.21E-09	6.82E-04	4.98E-11	1.09E-10	8.65E-07	1.62E-01	1.00E+00	1.00E+00
O3 – O3.CW2	3.60E-02	4.84E-02	9.07E-14	<1.00E-14		<1.00E-14	9.47E-01	3.23E-07	3.11E-07	6.16E-05	1.12E-01	1.00E+00	1.00E+00

Parameter	*E. coli*	Enterococci	*C. perfringens*	Somatic coliphages	*P. aeruginosa*	ICC	TCC	16S rRNA	*intI1*	*sul1*	ESBL *E. coli*	VRE	ESBL KEC
Statistical Test	Kruskal-Wallis	Kruskal-Wallis	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis
Comparison	p-values (<0.05 marked in grey)												
O3.BAC – O3.cS.BAC	1.13E-01	1.00E+00	1.76E-06	4.79E-01	8.31E-01	7.63E-01	1.82E-02	3.16E-02	1.54E-01	6.49E-01	1.00E+00	1.00E+00	1.00E+00
O3.BAC – O3.cS.A	4.23E-02	1.00E+00	5.87E-05	7.48E-01	1.00E+00	4.52E-01	4.77E-03	1.18E-01	1.35E-01	6.01E-01	1.00E+00	1.00E+00	1.00E+00
O3.BAC – O3.cS.A.GAC	8.88E-05	1.00E+00	1.97E-05	2.31E-01	9.03E-01	1.00E+00	4.62E-03	8.27E-07	1.20E-02	9.60E-02	1.00E+00	1.00E+00	1.00E+00
O3.BAC – O3.CW1	2.63E-03	1.00E+00	1.79E-11	1.25E-03		9.98E-01	1.32E-03	1.66E-06	5.45E-05	1.86E-03	1.00E+00	1.00E+00	1.00E+00
O3.BAC – O3.CW2	1.30E-02	1.00E+00	1.70E-06	1.88E-02		1.64E-04	8.79E-01	9.04E-03	6.05E-02	6.31E-02	1.00E+00	1.00E+00	1.00E+00
O3.cS.BAC – O3.cS.A	1.00E+00	1.00E+00	9.82E-01	1.00E+00	7.35E-01	9.99E-01	9.99E-01	9.98E-01	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
O3.cS.BAC –	7.68E-01	1.00E+00	1.00E+00	9.99E-01	9.99E-01	8.25E-01	9.97E-01	2.80E-02	9.10E-01	8.80E-01	1.00E+00	1.00E+00	1.00E+00

Parameter	*E. coli*	Enterococci	*C. perfringens*	Somatic coliphages	*P. aeruginosa*	ICC	TCC	16S rRNA	*intI1*	*sul1*	ESBL *E. coli*	VRE	ESBL KEC
Statistical Test	Kruskal-Wallis	Kruskal-Wallis	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis
Comparison	p-values (<0.05 marked in grey)												
O3.cS.A.GAC													
O3.cS.BAC – O3.CW1	1.00E+00	1.00E+00	2.80E-02	1.54E-01		4.77E-01	9.28E-01	4.56E-02	9.91E-02	1.40E-01	1.00E+00	1.00E+00	1.00E+00
O3.cS.BAC – O3.CW2	1.00E+00	1.00E+00	9.82E-01	5.97E-01		1.04E-06	5.67E-04	9.98E-01	9.99E-01	8.24E-01	1.00E+00	1.00E+00	1.00E+00
O3.cS.A – O3.cS.A.GAC	1.00E+00	1.00E+00	1.00E+00	9.68E-01	8.62E-01	5.36E-01	1.00E+00	6.50E-03	9.28E-01	9.07E-01	1.00E+00	1.00E+00	1.00E+00
O3.cS.A – O3.CW1	1.00E+00	1.00E+00	2.93E-03	6.46E-02		2.27E-01	9.94E-01	1.13E-02	1.13E-01	1.62E-01	1.00E+00	1.00E+00	1.00E+00
O3.S.A – O3.CW2	1.00E+00	1.00E+00	7.27E-01	3.64E-01		1.81E-07	1.26E-04	9.40E-01	1.00E+00	8.58E-01	1.00E+00	1.00E+00	1.00E+00
O3.cS.A.GAC – O3.CW1	1.00E+00	1.00E+00	1.21E-02	4.00E-01		9.96E-01	9.98E-01	1.00E+00	7.20E-01	8.41E-01	1.00E+00	1.00E+00	1.00E+00

Parameter	*E. coli*	Enterococci	*C. perfringens*	Somatic coliphages	*P. aeruginosa*	ICC	TCC	16S rRNA	*intI1*	*sul1*	ESBL *E. coli*	VRE	ESBL KEC
Statistical Test	Kruskal-Wallis	Kruskal-Wallis	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	oneway-ANOVA	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis
Comparison	p-values (<0.05 marked in grey)												
O3.cS.A.GAC – O3.CW2	1.00E+00	1.00E+00	9.10E-01	8.75E-01		2.07E-04	1.34E-04	1.17E-01	9.94E-01	1.00E+00	1.00E+00	1.00E+00	1.00E+00
O3.CW1 – O3.CW2	1.00E+00	1.00E+00	3.48E-01	9.91E-01		2.57E-03	3.89E-05	1.72E-01	2.83E-01	8.60E-01	1.00E+00	1.00E+00	1.00E+00

Table S3: Results (p-values) for Kruskal-Wallis followed by Dunn-Bonferoni post hoc test on relative abundances *intI*1/16S rRNA and *sul*1/16S rRNA in the effluents of the investigated treatments. Significant differences ($p<0.05$) are marked in grey.

Parameter	*intI*1/16S rRNA	*sul*1/16S rRNA
Statistical Test	Kruskal-Wallis	Kruskal-Wallis
Comparison	p-values (<0.05 marked in grey)	
BAC - CW1	1	1
BAC - CW2	1	1
CW1 - CW2	1	1
BAC - O3_eff	1	1
CW1 - O3_eff	1	1
CW2 - O3_eff	1	1
BAC - O3_in	1	0.3156
CW1 - O3_in	0.3871	0.0289
CW2 - O3_in	0.8232	0.0158
O3_eff - O3_in	1	1
BAC - cS.A	1	1
CW1 - cS.A	1	1
CW2 - cS.A	1	1
O3_eff - cS.A	1	1
O3_in - cS.A	0.3249	0.1103
BAC - cS.A.GAC	1	1
CW1 - cS.A.GAC	0.8568	1
CW2 - cS.A.GAC	1	1
O3_eff - cS.A.GAC	1	1
O3_in - cS.A.GAC	1	1

Parameter	*intI*1/16S rRNA	*sul*1/16S rRNA
Statistical Test	Kruskal-Wallis	Kruskal-Wallis
Comparison	p-values (<0.05 marked in grey)	
cS.A - cS.A.GAC	0.7846	1
BAC - cS.BAC	1	1
CW1 - cS.BAC	1	1
CW2 - cS.BAC	1	1
O3_eff - cS.BAC	1	1
O3_in - cS.BAC	1	0.4844
cS.A - cS.BAC	1	1
cS.A.GAC - cS.BAC	1	1