Electronic Supplementary Information: Application of *in vitro* bioassays for water quality monitoring in three drinking water treatment plants using different treatment processes including biological treatment, nanofiltration and ozonation coupled with disinfection

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Table S1: Selected water quality parameters of the source water feeding the three WTPs.

Parameter	WTP	May 2018	July 2018	October 2018	December 2018
Turbidity (NTU)	Méry-sur-Oise*	5.1	5.3	3.2	14.3
	Choisy-le-Roi	5.0	5.0	2.0	4.0
	Neuilly-sur-Marne	10.0	12.6	8.0	6.0
Total organic carbon (mg/L)	Méry-sur-Oise	2.7	2.0	2.9	3.7
	Choisy-le-Roi	2.8	2.7	2.3	2.9
	Neuilly-sur-Marne	2.5	2.4	2.5	3.2
Temperature (°C)	Méry-sur-Oise	17.8	23.7	15.3	9.2
	Choisy-le-Roi	18.2	24.4	16.6	9.9
	Neuilly-sur-Marne	18.1	24.4	16.2	8.9
Flow rate (m^3/s)	Méry-sur-Oise	78	54	36	47
	Choisy-le-Roi	214	106	90	93
	Neuilly-sur-Marne	110	42	46	50

*units of formazin nephelometric unit (FNU).

Table S2: Selected water quality parameters of the produced water from the three WTPs.

Parameter	WTP	May 2018	July 2018	October 2018	December 2018
Turbidity (NTU)	Méry-sur-Oise	0.02	0.02	0.02	0.04
	Choisy-le-Roi*	0.03	0.03	0.03	0.03
	Neuilly-sur-Marne	0.03	0.03	0.04	0.04
Total organic carbon (mg/L)	Méry-sur-Oise	0.36	0.48	0.3	0.4
	Choisy-le-Roi	1.3	1.0	1.0	1.2
	Neuilly-sur-Marne	1.0	0.9	1.1	1.3
Temperature (°C)	Méry-sur-Oise	14.1	24.5	16.7	9.3
	Choisy-le-Roi	14.5	24.9	16.3	9.1
	Neuilly-sur-Marne	14.3	24.5	16.3	9.5
Residual free chlorine (mg/L)	Méry-sur-Oise	0.25	0.35	0.35	0.25
	Choisy-le-Roi	0.30	0.40	0.40	0.30
	Neuilly-sur-Marne	0.40	0.47	0.51	0.50
Conductivity (µS/cm)	Méry-sur-Oise	457	520	485	460
	Choisy-le-Roi	570	580	495	430
	Neuilly-sur-Marne	573	632	500	633
pH	Méry-sur-Oise	7.71	7.55	7.84	7.94
	Choisy-le-Roi	7.58	7.40	7.61	7.74
	Neuilly-sur-Marne	7.38	7.28	7.54	7.70

*units of formazin nephelometric unit (FNU).

Table S3: IC_{10} and EC_{10} values for ERα GeneBLAzer (agonist mode) in units of relative enrichment factor (REF).

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{10} (REF)	*Activation of ER EC_{10} (REF)*	*Cytotoxicity IC_{10} (REF)*	*Activation of ER EC_{10} (REF)*
Méry-sur-Oise	Source	N/A	N/A	74.0	26.0 ± 8.8
	After nanofiltration	>100	>100	>100	>100
	After biological treatment	68.5	Cytotoxic	77.6	Cytotoxic
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	2.56 ± 0.2	51.4 ± 5.3	11.2 ± 4.9
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	55.5	1.09 ± 0.2	65.6	3.12 ± 0.6
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Control	Bottled water with sodium thiosulphate	>100	2.34 ± 0.6	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>100	>100

WTP	Sample Name	October 2018		December 2018	
		Cytotoxicity IC_{10} (REF))	*Activation of ER EC_{10} (REF)*	*Cytotoxicity IC_{10} (REF)*	*Activation of ER EC_{10} (REF))*
Méry-sur-Oise	Source	38.4	23.2 ± 1.5	37.5	14.4 ± 0.7
	After nanofiltration	>150	>150	>150	>150
	After biological treatment	>150	>150	N/A	N/A
	Produced water	>150	>150	>150	>150
Choisy-le-Roi	Source	40.2	15.9 ± 0.6	41.6	4.45 ± 0.21
	After UV treatment	>150	>150	>150	132 ± 13
	Produced water	>150	>150	>150	>150
Neuilly-sur-Marne	Source	30.9	12.8 ± 0.8	33.3	4.78 ± 0.21
	After UV treatment	>150	>150	>150	>150
	Produced water	>150	>150	>150	110 ± 9.0
Control	Bottled water with sodium thiosulphate	>150	>150	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>150	>150

Figure S1: Example full concentration-effect curves for induction (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in ERα GeneBLAzer (agonist mode) (left plot), along with linear concentration-effect curves for induction (centre plot) and cytotoxicity (right plot).

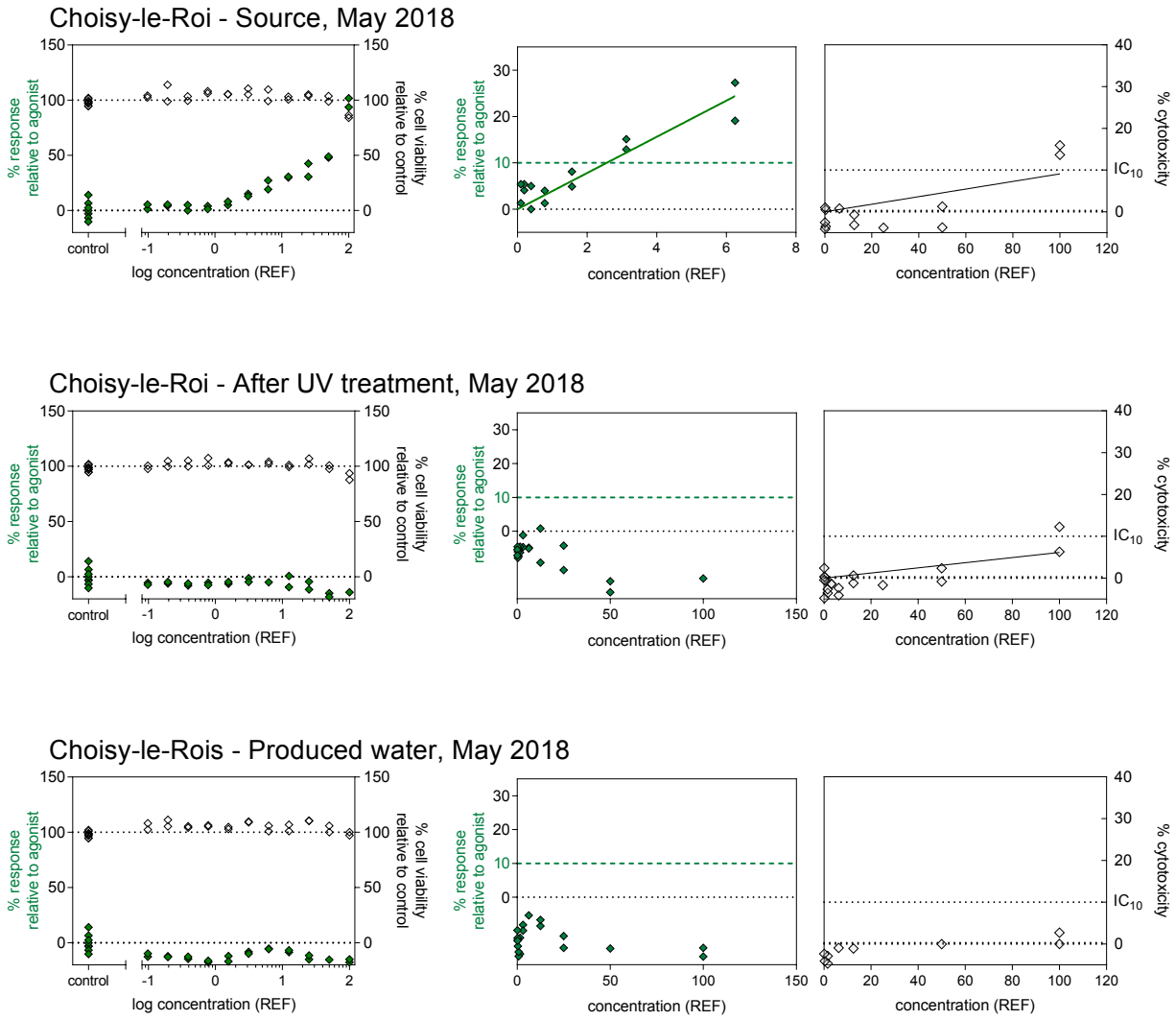


Table S4: IC_{01} and $EC_{SR0.2}$ values for ERα GeneBLAzer (antagonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{01} (REF)	*Inhibition of ER $EC_{SR0.2}$ (REF)*	*Cytotoxicity IC_{01} (REF)*	*Inhibition of ER $EC_{SR0.2}$ (REF)*
Méry-sur-Oise	Source	N/A	N/A	7.33	Cytotoxic
	After nanofiltration	>100	>100	5.52	Cytotoxic
	After biological treatment	19.7	Cytotoxic	4.61	Cytotoxic
	Produced water	>100	>100	4.21	Cytotoxic
Choisy-le-Roi	Source	17.0	Cytotoxic	6.67	Cytotoxic
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	7.05	Cytotoxic	10.12	Cytotoxic
	After UV treatment	>100	>100	14.37	Cytotoxic
	Produced water	>100	>100	>100	>100
Control	Bottled water with sodium thiosulphate	99.6	Cytotoxic	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	0.37	Cytotoxic

Table S5: IC_{10} and EC_{10} values for AR GeneBLAzer (agonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{10} (REF)	*Activation of AR EC_{10} (REF)*	*Cytotoxicity IC_{10} (REF)*	*Activation of AR EC_{10} (REF)*
Méry-sur-Oise	Source	N/A	N/A	>100	>100
	After nanofiltration	>100	>100	90.3	Cytotoxic
	After biological treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	>100	61.2	Cytotoxic
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	>100	>100	99.0	Cytotoxic
	After UV treatment	>100	>100	>100	>100
	Produced water	56.1	Cytotoxic	>100	>100
Control	Bottled water with sodium thiosulphate	>100	>100	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>100	>100

Table S6: IC_{01} and $EC_{SR0.2}$ values for AR GeneBLAzer (antagonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{01} (REF)	*Inhibition of AR $EC_{SR0.2}$ (REF)*	*Cytotoxicity IC_{01} (REF)*	*Inhibition of AR $EC_{SR0.2}$ (REF)*
Méry-sur-Oise	Source	N/A	N/A	81.6	Cytotoxic
	After nanofiltration	>100	>100	13.7	Cytotoxic
	After biological treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	>100	5.57	Cytotoxic
	After UV treatment	53.5	Cytotoxic	10.5	Cytotoxic
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	>100	>100	8.38	Cytotoxic
	After UV treatment	32.6	Cytotoxic	>100	>100
	Produced water	5.09	Cytotoxic	>100	>100
Control	Bottled water with sodium thiosulphate	>100	>100	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>100	>100

Table S7: IC_{10} and EC_{10} values for GR GeneBLAzer (agonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{10} (REF)	*Activation of GR EC_{10} (REF)*	*Cytotoxicity IC_{10} (REF)*	*Activation of GR EC_{10} (REF)*
Méry-sur-Oise	Source	N/A	N/A	50.0	Cytotoxic
	After nanofiltration	>100	>100	>100	>100
	After biological treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	>100	71.8	Cytotoxic
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	>100	>100	>100	>100
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Control	Bottled water with sodium thiosulphate	>100	>100	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>100	>100

Table S8: IC_{01} and $EC_{SR0.2}$ values for GR GeneBLAzer (antagonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{01} (REF)	*Inhibition of GR $EC_{SR0.2}$ (REF)*	*Cytotoxicity IC_{01} (REF)*	*Inhibition of GR $EC_{SR0.2}$ (REF)*
Méry-sur-Oise	Source	N/A	N/A	4.08	Cytotoxic
	After nanofiltration	22.8	Cytotoxic	10.4	Cytotoxic
	After biological treatment	25.9	Cytotoxic	9.77	Cytotoxic
	Produced water	22.9	Cytotoxic	17.1	Cytotoxic
Choisy-le-Roi	Source	22.0	Cytotoxic	5.21	Cytotoxic
	After UV treatment	41.3	Cytotoxic	>100	>100
	Produced water	>100	>100		Cytotoxic
Neuilly-sur-Marne	Source	25.3	Cytotoxic	16.0	Cytotoxic
	After UV treatment	>100	>100	>100	>100
	Produced water	11.5	Cytotoxic	>100	>100
Control	Bottled water with sodium thiosulphate	15.3	Cytotoxic	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	8.53	Cytotoxic

Table S9: IC_{10} and EC_{10} values for PR GeneBLAzer (agonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{10} (REF)	*Activation of PR EC_{10} (REF)*	*Cytotoxicity IC_{10} (REF)*	*Activation of PR EC_{10} (REF)*
Méry-sur-Oise	Source	N/A	N/A	>100	>100
	After nanofiltration	>100	>100	>100	>100
	After biological treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	>100	>100	>100
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	>100	>100	>100	>100
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Control	Bottled water with sodium thiosulphate	>100	>100	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>100	>100

Table S10: IC_{01} and $EC_{SR0.2}$ values for PR GeneBLAzer (antagonist mode) in units of relative enrichment factor (REF). NB: samples were not run in October and December 2018.

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{01} (REF)	*Inhibition of PR $EC_{SR0.2}$ (REF)*	*Cytotoxicity IC_{01} (REF)*	*Inhibition of PR $EC_{SR0.2}$ (REF)*
Méry-sur-Oise	Source	N/A	N/A	13.8	Cytotoxic
	After nanofiltration	38.2	Cytotoxic	>100	>100
	After biological treatment	>100	>100	87.4	Cytotoxic
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	>100	13.2	Cytotoxic
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	>100	>100	>100	>100
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Control	Bottled water with sodium thiosulphate	>100	>100	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	37.1	Cytotoxic

Figure S2: Example full concentration-effect curves for inhibition (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in ERα GeneBLAzer (antagonist mode) (left plot), along with linear concentration-effect curves for inhibition (centre plot) and cytotoxicity (right plot).

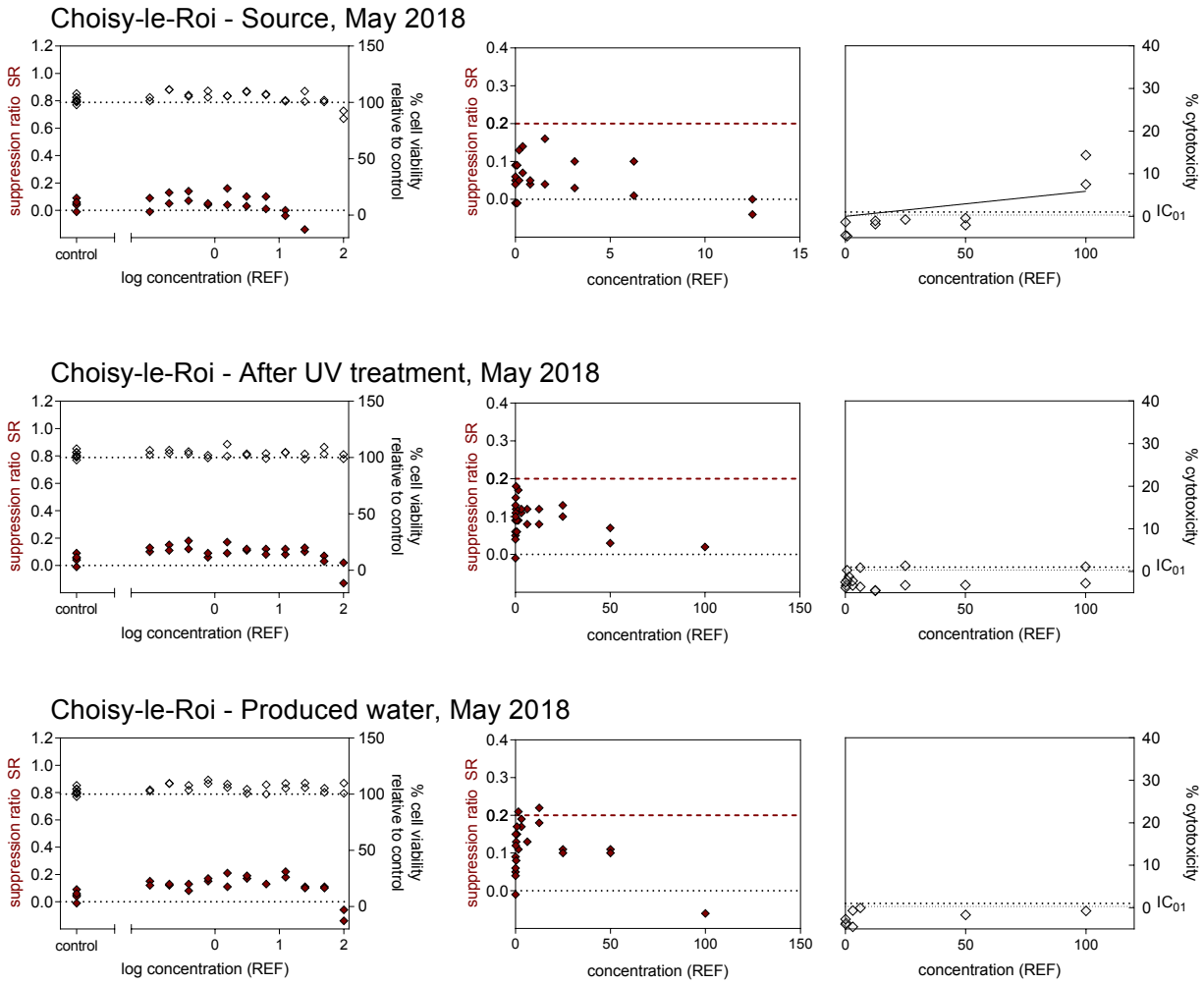


Figure S3: Example full concentration-effect curves for induction (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in AR GeneBLAzer (agonist mode) (left plot), along with linear concentration-effect curves for induction (centre plot) and cytotoxicity (right plot).

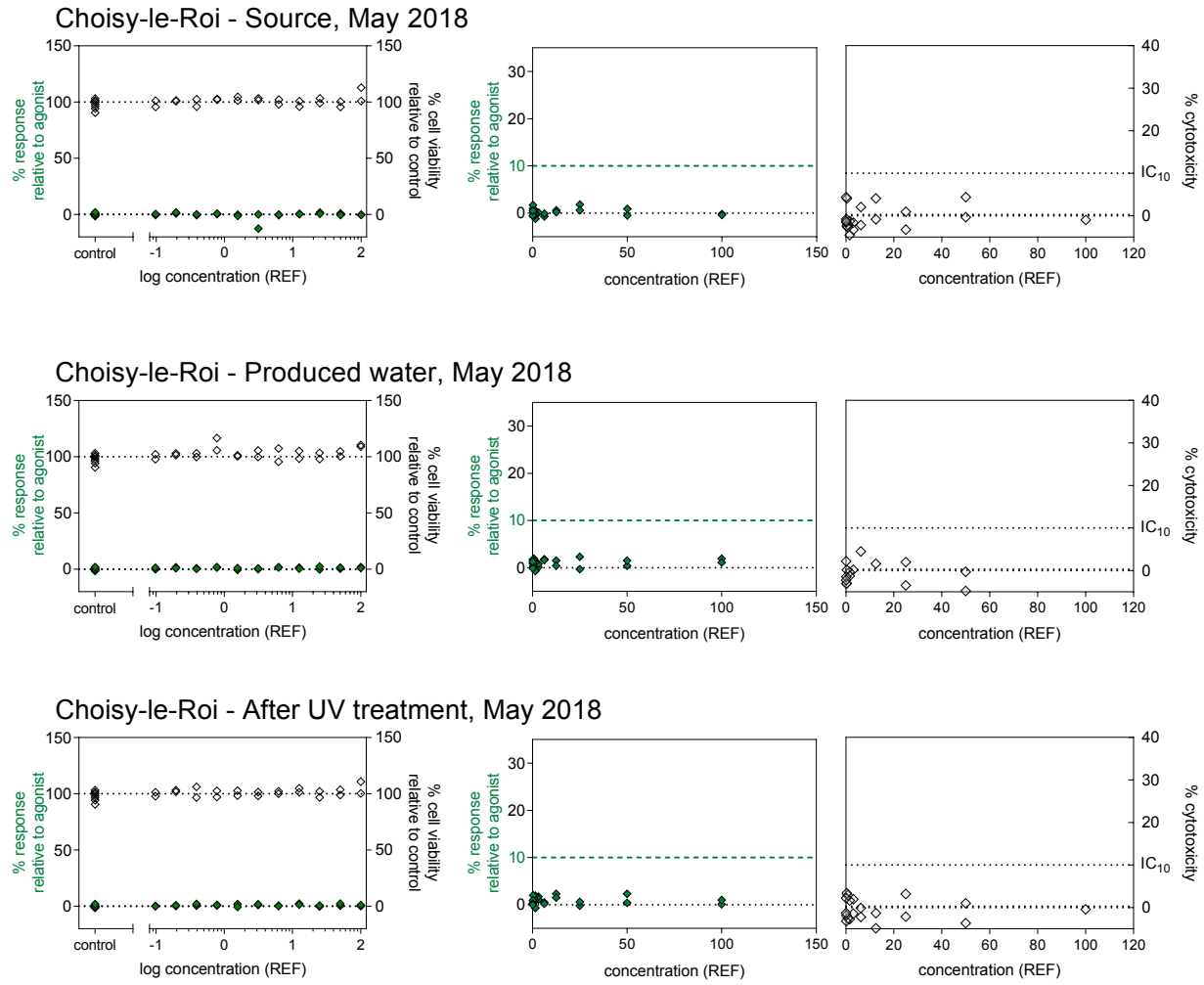


Figure S4: Example full concentration-effect curves for inhibition (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in AR GeneBLAzer (antagonist mode) (left plot), along with linear concentration-effect curves for inhibition (centre plot) and cytotoxicity (right plot).

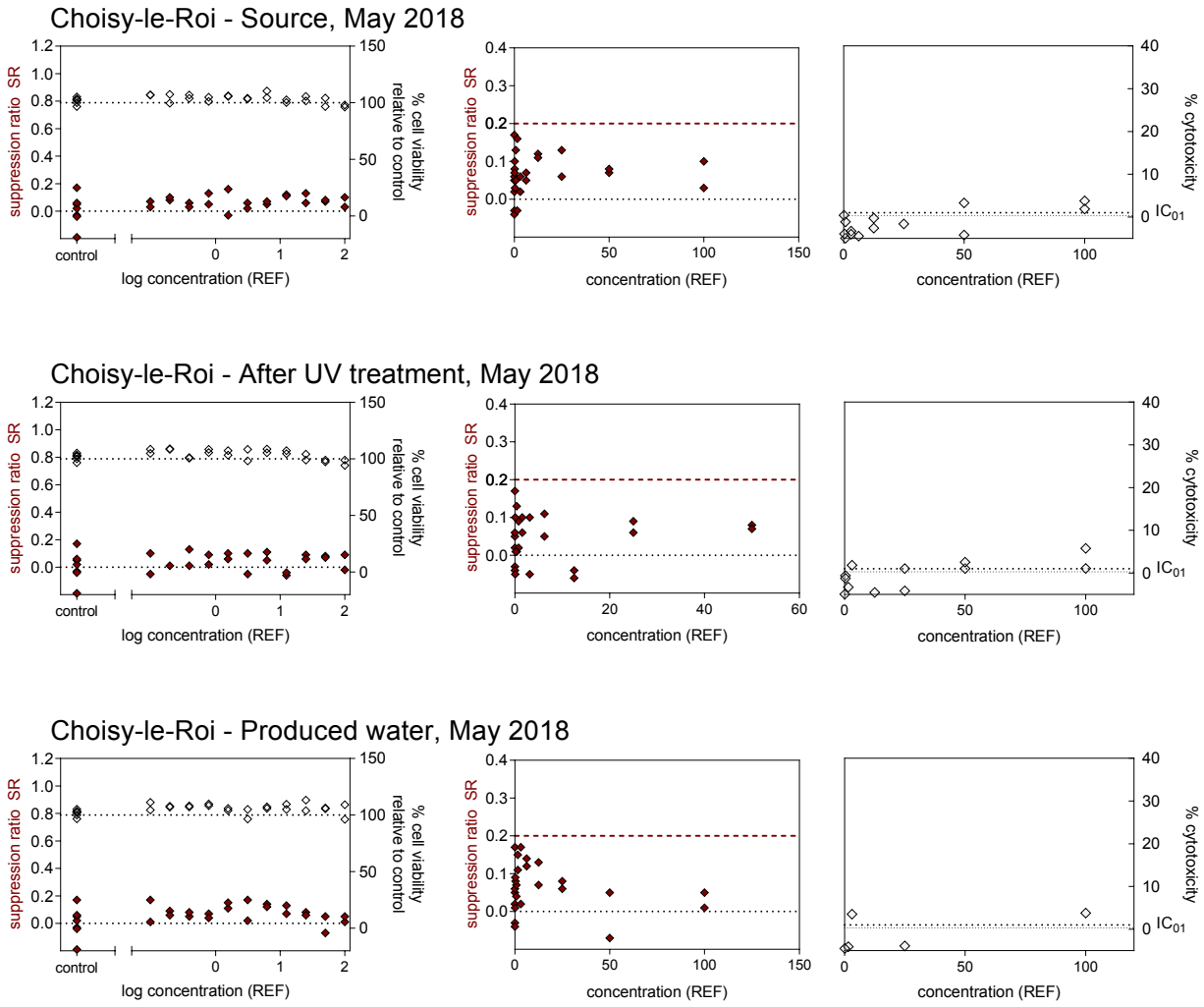


Figure S5: Example full concentration-effect curves for induction (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in GR GeneBLAzer (agonist mode) (left plot), along with linear concentration-effect curves for induction (centre plot) and cytotoxicity (right plot).

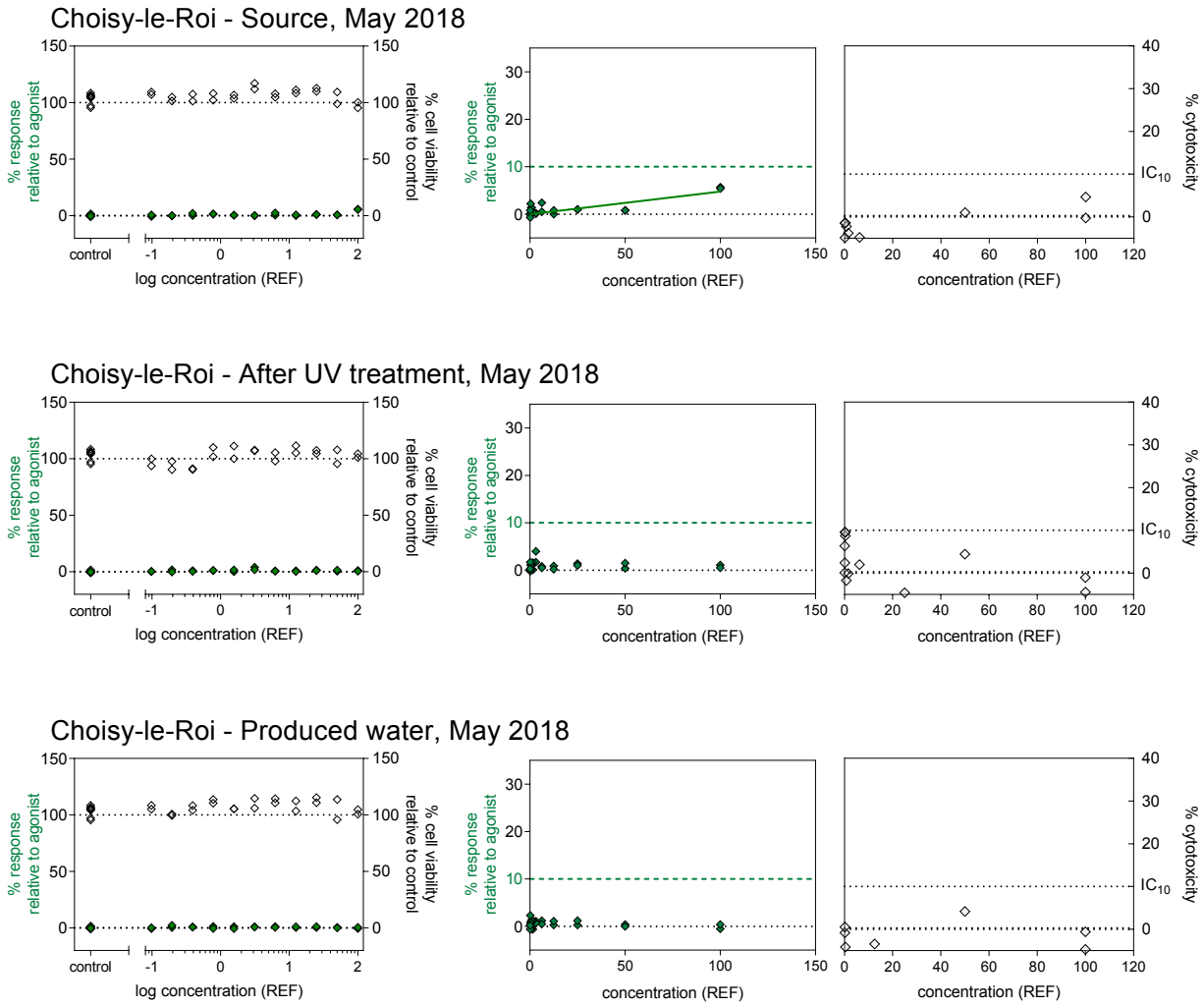


Figure S6: Example full concentration-effect curves for inhibition (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in GR GeneBLAzer (antagonist mode) (left plot), along with linear concentration-effect curves for inhibition (centre plot) and cytotoxicity (right plot).

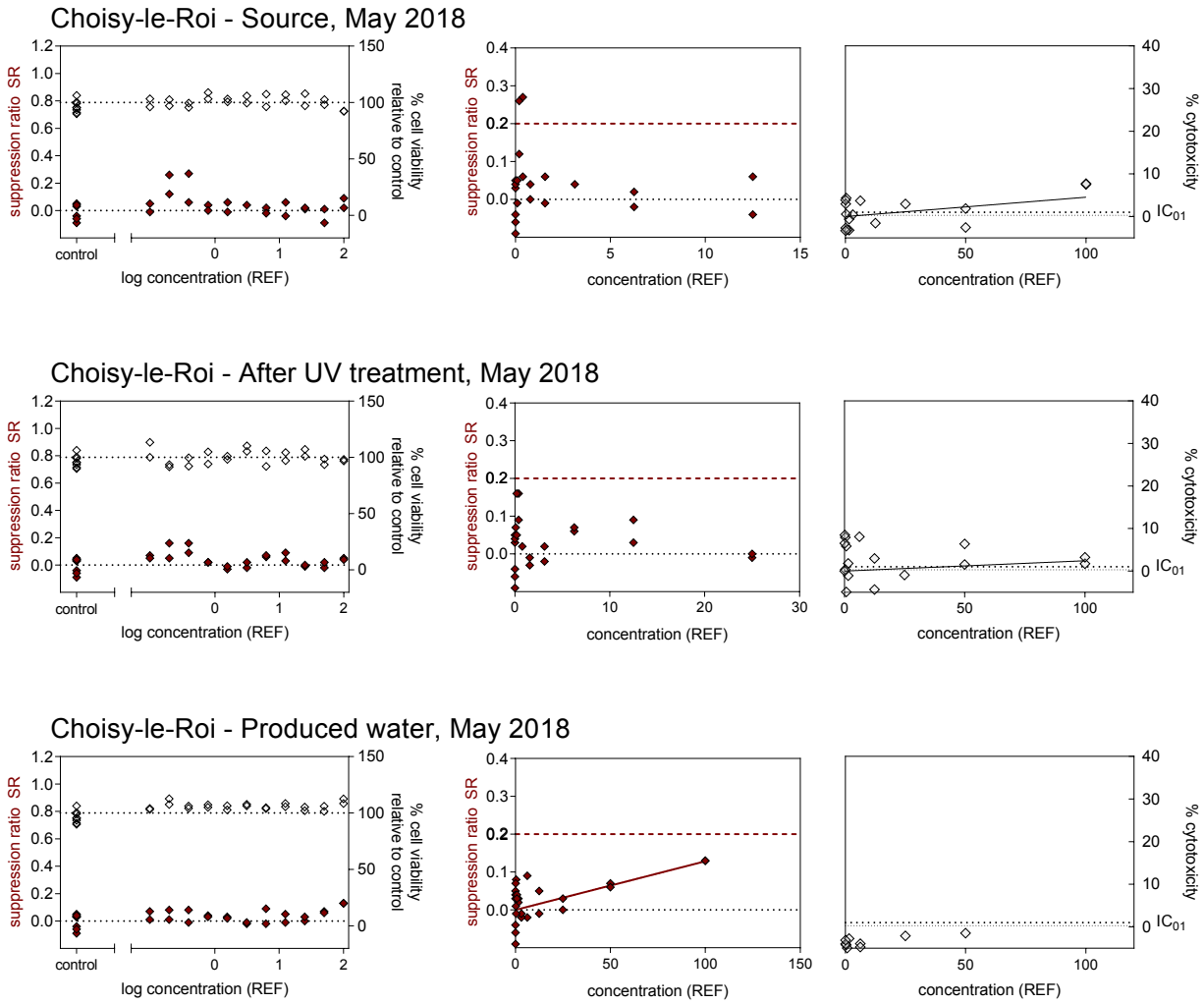


Figure S7: Example full concentration-effect curves for induction (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in PR GeneBLAzer (agonist mode) (left plot), along with linear concentration-effect curves for induction (centre plot) and cytotoxicity (right plot).

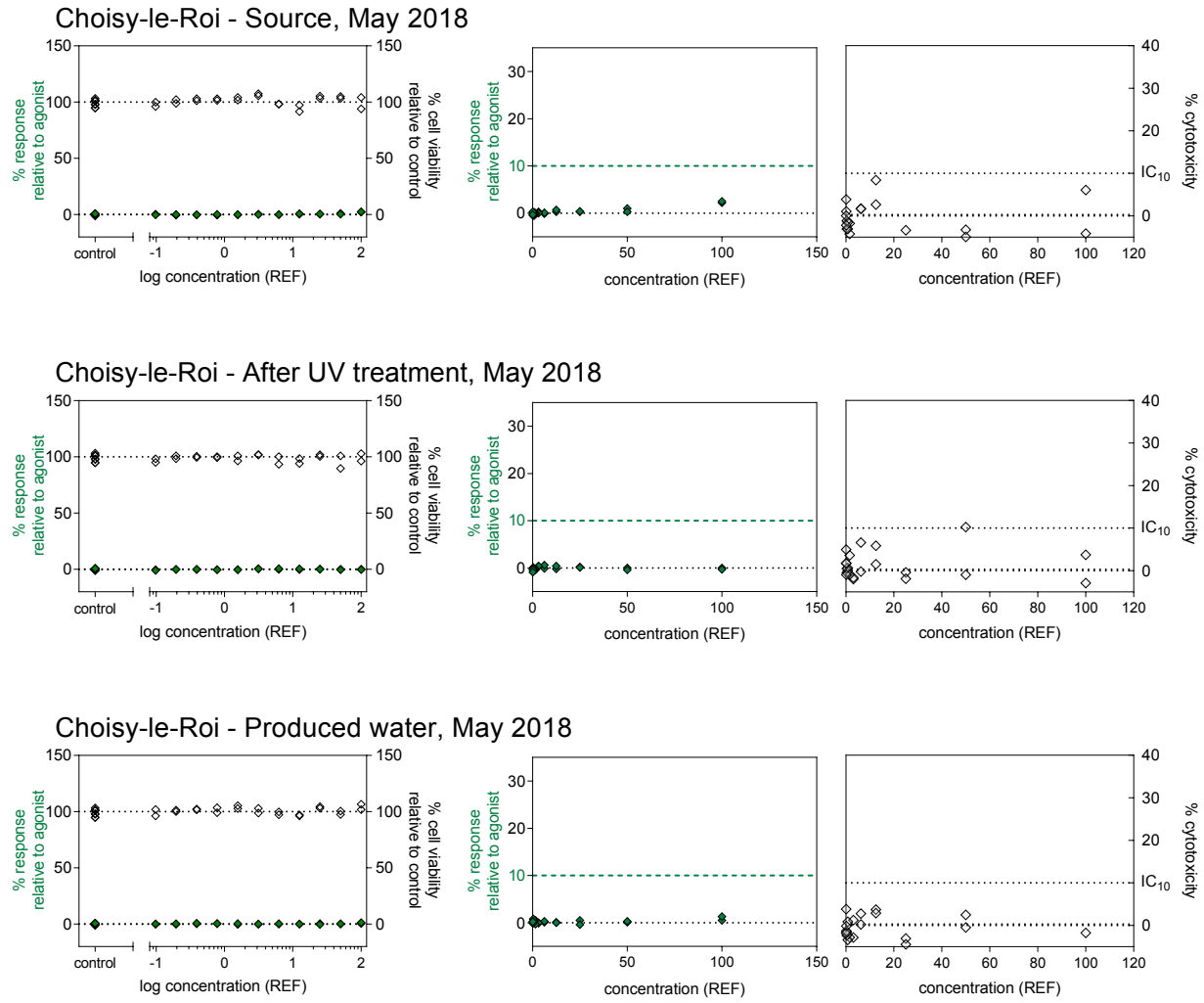


Figure S8: Example full concentration-effect curves for inhibition (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in PR GeneBLAzer (antagonist mode) (left plot), along with linear concentration-effect curves for inhibition (centre plot) and cytotoxicity (right plot).

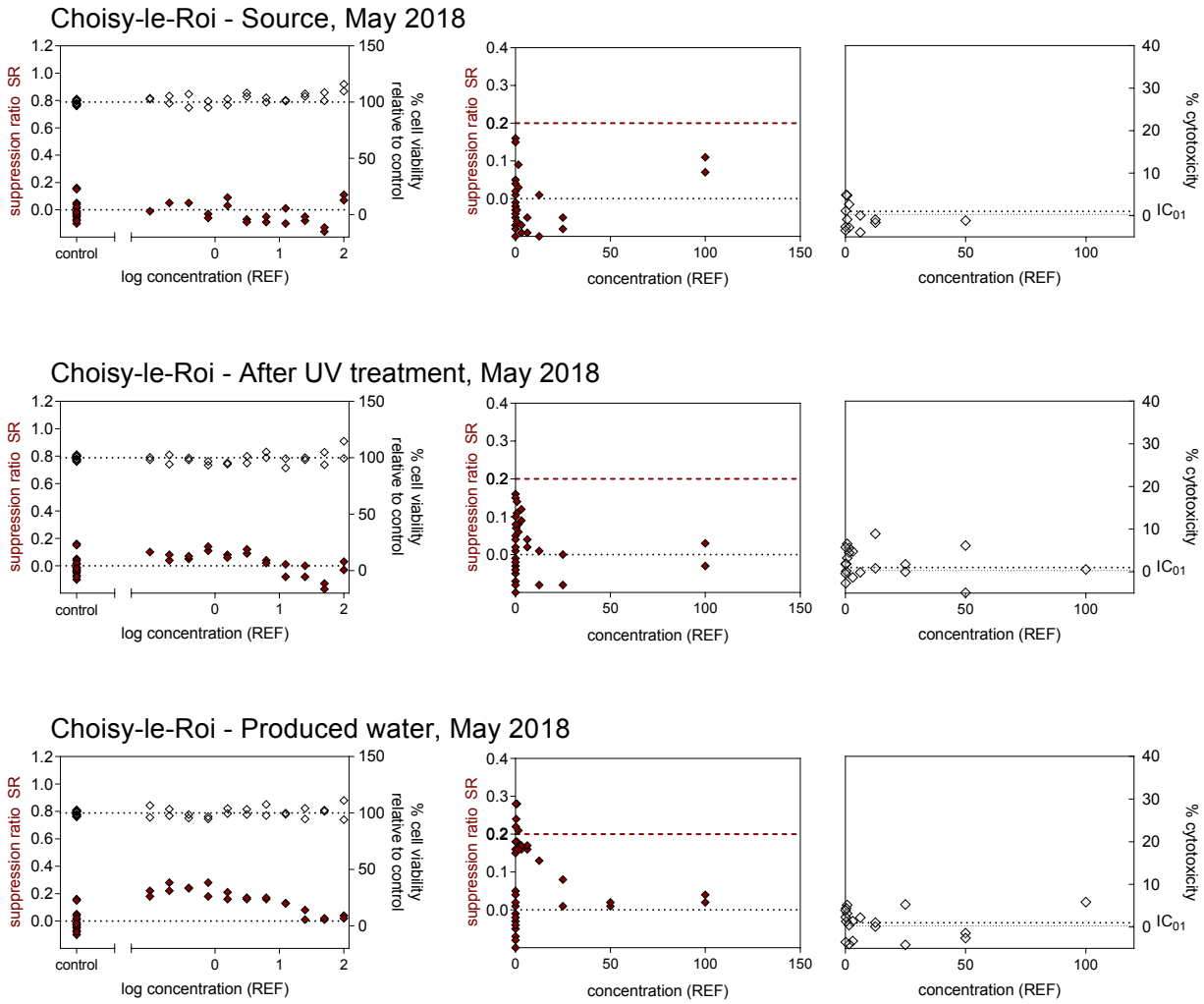


Figure S9: Example full concentration-effect curves for induction (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in AREc32 (agonist mode) (left plot), along with linear concentration-effect curves for induction (centre plot) and cytotoxicity (right plot).

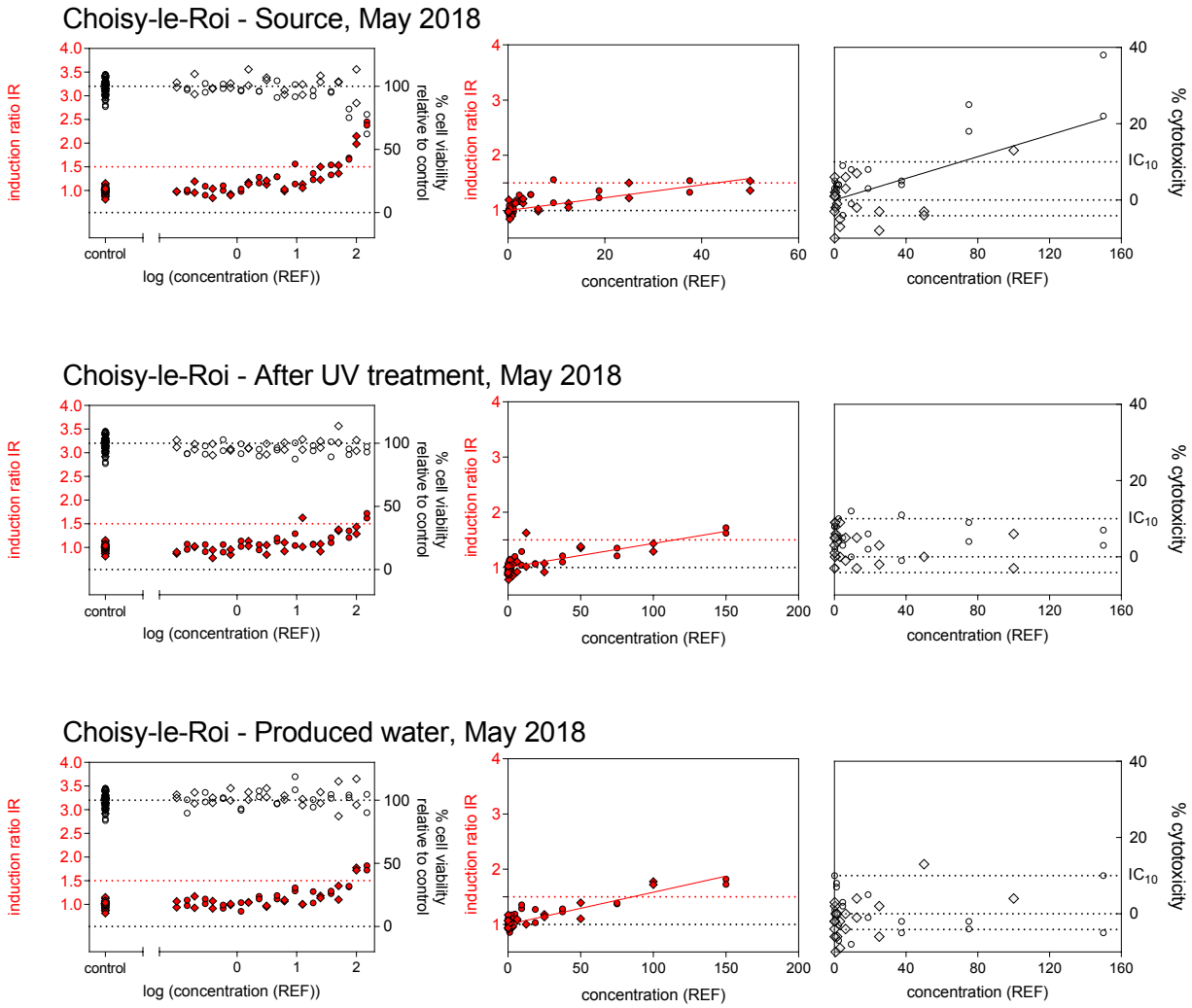


Figure S10: Example full concentration-effect curves for induction (filled symbols) for Choisy-le-Roi (May 2018) in NF-κB GeneBLAzer (agonist mode) (left plot), along with linear concentration-effect curves for induction (right plot).

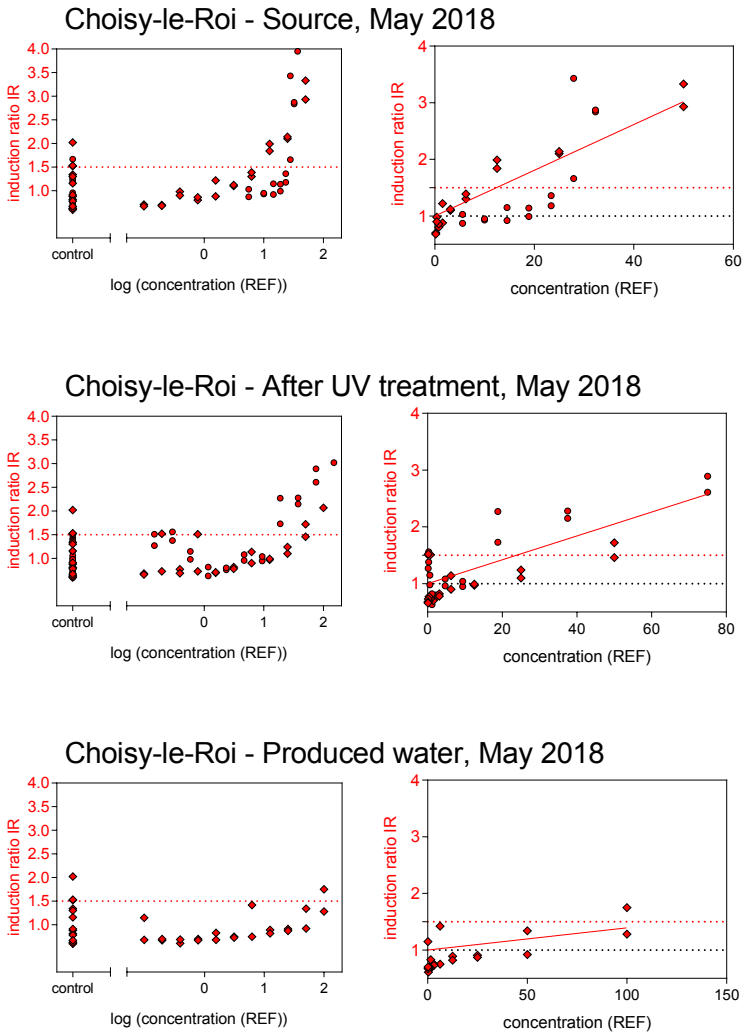


Figure S11: Example full concentration-effect curves for induction (filled symbols) and cell viability (empty symbols) for Choisy-le-Roi (May 2018) in p53RE GeneBLAzer (agonist mode) (left plot), along with linear concentration-effect curves for induction (centre plot) and cytotoxicity (right plot).

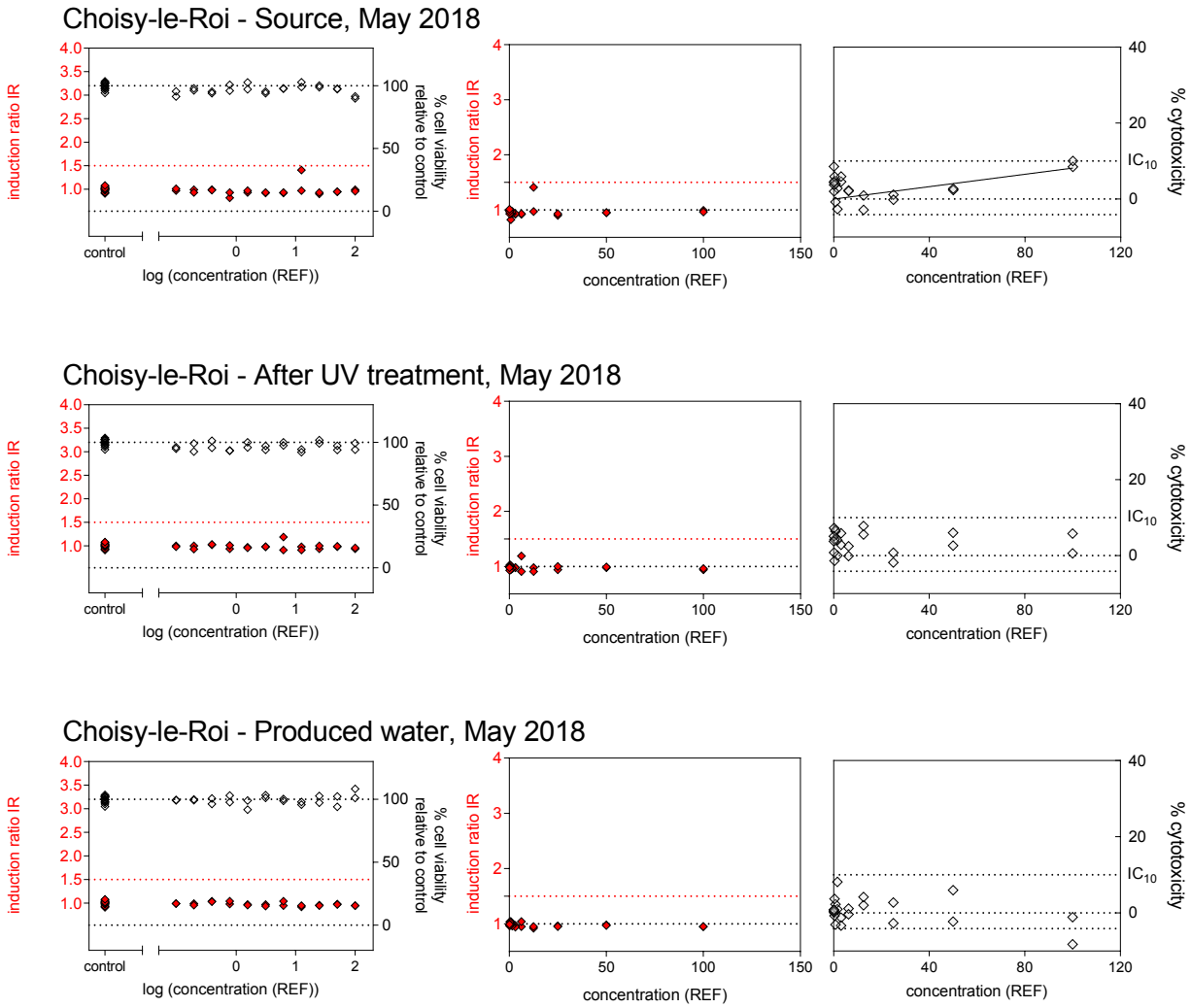


Table S11: IC_{10} and $EC_{IR1.5}$ values for AREc32 in units of relative enrichment factor (REF).

WTP	Sample Name	May 2018		July 2018	
		Cytotoxicity IC_{10} (REF)	*Oxidative stress response $EC_{IR1.5}$ (REF)*	*Cytotoxicity IC_{10} (REF)*	*Oxidative stress response $EC_{IR1.5}$ (REF)*
Méry-sur-Oise	Source	N/A	N/A	37.5	Cytotoxic
	After nanofiltration	>100	114 ± 7.6	>100	>100
	After biological treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	70.3	43.0 ± 5.1	36.4	Cytotoxic
	After UV treatment	>150	115 ± 12	>100	>100
	Produced water	>150	85.8 ± 5.5	>100	>100
Neuilly-sur-Marne	Source	88.9	61.5 ± 4.9	>100	>100
	After UV treatment	>150	127 ± 12	>100	>100
	Produced water	>150	86.1 ± 6.3	>150	103 ± 7.1
Control	Bottled water with sodium thiosulphate	>100	>100	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>100	>100

WTP	Sample Name	October 2018		December 2018	
		Cytotoxicity IC_{10} (REF))	*Oxidative stress response $EC_{IR1.5}$ (REF)*	*Cytotoxicity IC_{10} (REF)*	*Oxidative stress response $EC_{IR1.5}$ (REF)*
Méry-sur-Oise	Source	45.5	Cytotoxic	40.6	Cytotoxic
	After nanofiltration	>150	136 ± 7.4	>150	>150
	After biological treatment	>150	82.3 ± 3.1	N/A	N/A
	Produced water	>150	102 ± 6.1	>150	>150
Choisy-le-Roi	Source	59.0	Cytotoxic	49.7	Cytotoxic
	After UV treatment	>150	>150	>150	114 ± 8.4
	Produced water	>150	>150	>150	77.5 ± 3.6
Neuilly-sur-Marne	Source	49.2	Cytotoxic	36.0	Cytotoxic
	After UV treatment	>150	88.0 ± 4.4	>150	>150
	Produced water	>150	87.2 ± 4.2	>150	>150
Control	Bottled water with sodium thiosulphate	>150	>150	N/A	N/A
	Bottled water without sodium thiosulphate	N/A	N/A	>150	>150

Table S12: $EC_{IR1.5}$ values for NF-κB GeneBLAzer in units of relative enrichment factor (REF).

WTP	Sample Name	**May 2018** *NF-κB response* $EC_{IR1.5}$ *(REF)*	**July 2018** *NF-κB response* $EC_{IR1.5}$ *(REF)*	**October 2018** *NF-κB response* $EC_{IR1.5}$ *(REF))*	**December 2018** *NF-κB response* $EC_{IR1.5}$ *(REF)*
Méry-sur-Oise	Source	N/A	>100	17.0 ± 3.7	6.23 ± 0.6
	After nanofiltration	>100	>100	>150	117 ± 32
	After biological treatment	32.4 ± 8.3	>100	56.8 ± 5.5	N/A
	Produced water	80.4 ± 18	>100	65.2 ± 8.9	49.4 ± 5.3
Choisy-le-Roi	Source	12.4 ± 1.2	39.1 ± 3.6	16.9 ± 1.1	5.11 ± 0.6
	After UV treatment	23.8 ± 2.7	40.8 ± 5.4	122 ± 20	49.6 ± 5.3
	Produced water	>100	>100	25.8 ± 3.1	118 ± 23
Neuilly-sur-Marne	Source	6.71 ± 0.5	38.1 ± 2.7	6.37 ± 0.6	7.71 ± 0.7
	After UV treatment	42.0 ± 5.2	>100	37.5 ± 2.9	51.0 ± 4.4
	Produced water	52.4 ± 9.3	>100	15.6 ± 1.4	68.4 ± 9.1
Control	Bottled water with sodium thiosulphate	>100	N/A	106 ± 26	N/A
	Bottled water without sodium thiosulphate	N/A	>100	N/A	>150

Table S13: IC_{10} values for p53RE GeneBLAzer in units of relative enrichment factor (REF). None of the samples were active in the assay.

WTP	**Sample Name**	**May 2018** *Cytotoxicity* IC_{10} *(REF)*	**July 2018** *Cytotoxicity* IC_{10} *(REF)*	**October 2018** *Cytotoxicity* IC_{10} *(REF)*	**December 2018** *Cytotoxicity* IC_{10} *(REF)*
Méry-sur-Oise	Source	N/A	34.5	55.5	40.3
	After nanofiltration	>100	>100	>100	>100
	After biological treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Choisy-le-Roi	Source	>100	50.2	57.2	37.6
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Neuilly-sur-Marne	Source	86.6	62.2	57.6	43.8
	After UV treatment	>100	>100	>100	>100
	Produced water	>100	>100	>100	>100
Control	Bottled water with sodium thiosulphate	>100	N/A	>100	N/A
	Bottled water without sodium thiosulphate	N/A	>100	N/A	>100

Figure S12: Concentration-effect curves for growth inhibition in *Salmonella typhimurium* TA98.

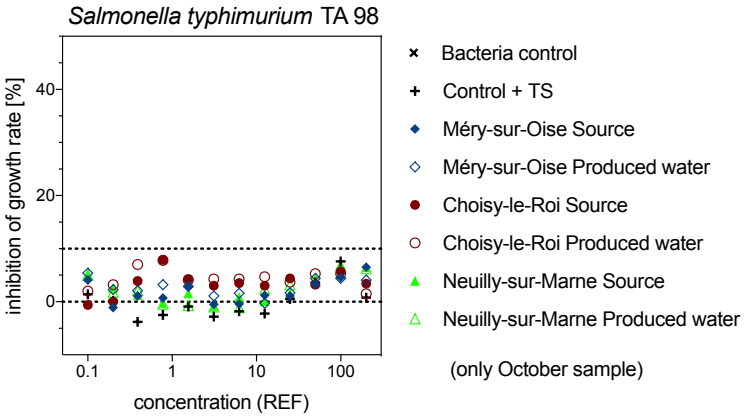


Figure S13: Concentration-effect curves of positive controls in *Salmonella typhimurium* TA98, TA100 and YG7108.

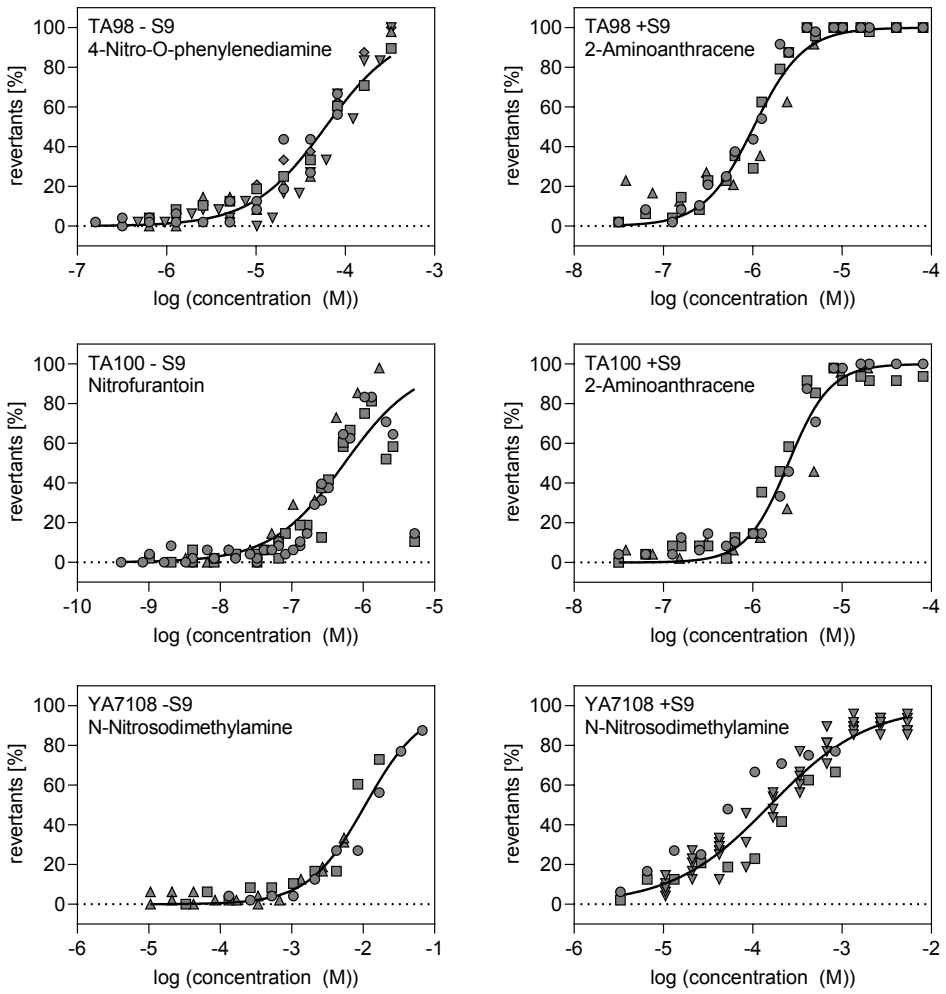
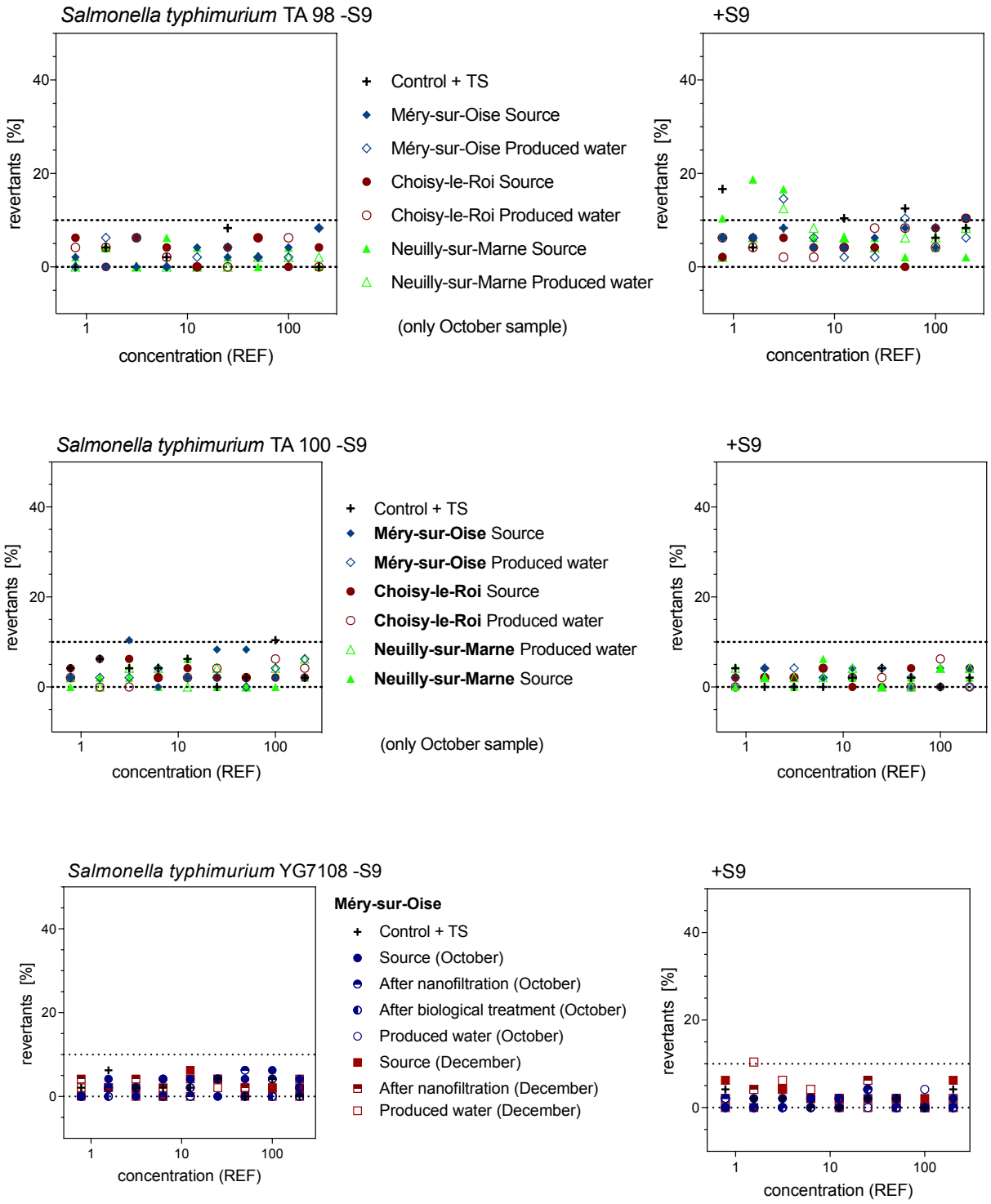
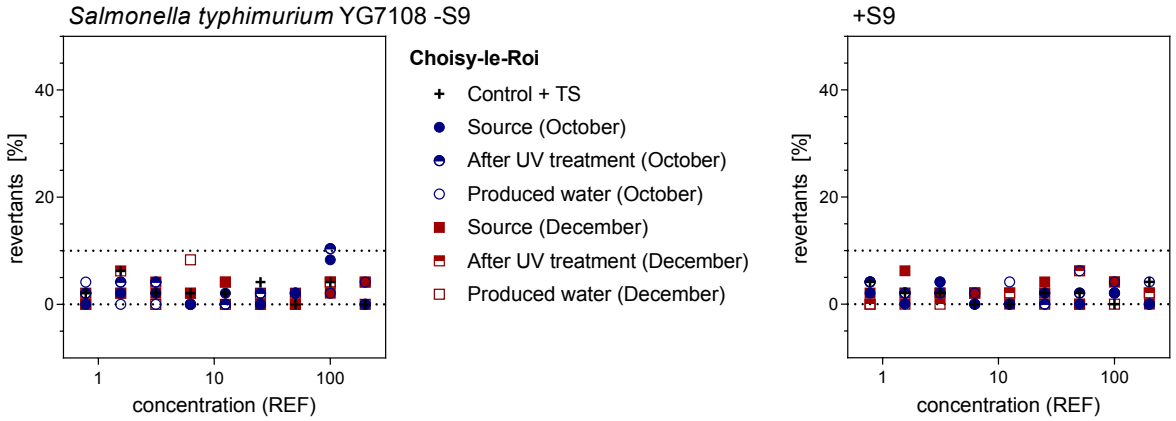
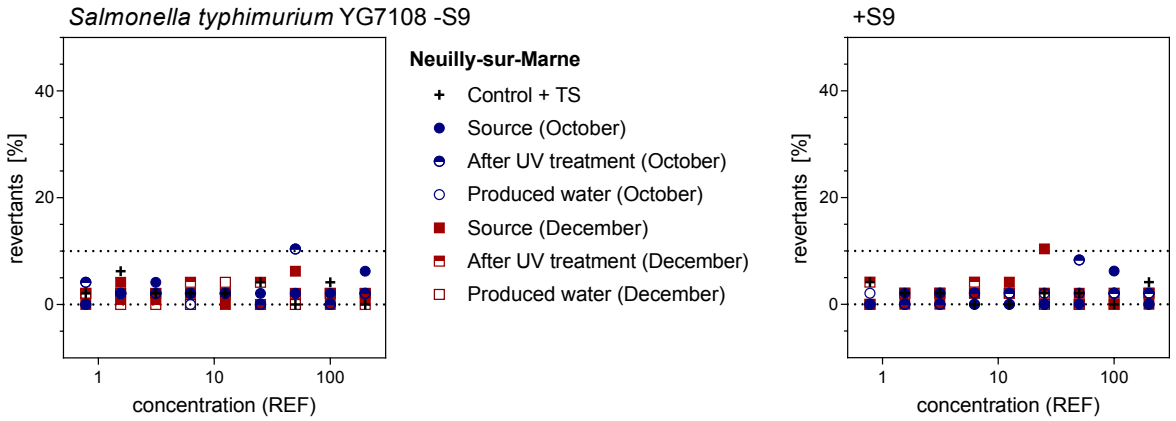


Figure S14: Concentration-effect curves of water extracts in *Salmonella typhimurium* TA98, TA100 and YG7108 with and without 0.15 $mg_{protein}$/mL S9.




Salmonella typhimurium YG7108 -S9
+S9
Choisy-le-Roi
Control + TS
Source (October)
After UV treatment (October)
Produced water (October)
Source (December)
After UV treatment (December)
Produced water (December)
revertants [%]
concentration (REF)
0
20
40
1
10
100


Salmonella typhimurium YG7108 -S9
+S9
Neuilly-sur-Marne
Control + TS
Source (October)
After UV treatment (October)
Produced water (October)
Source (December)
After UV treatment (December)
Produced water (December)
revertants [%]
concentration (REF)
0
20
40
1
10
100