Supporting Information

Occurrence of N-nitrosamines and their precursors in Spanish drinking water treatment plants and distribution systems

Maria José Farré[1,2,†], Sara Insa[1,2], Aaron Lamb[3], Cristian Cojocariu[3], and Wolfgang Gernjak[1,4]

[1] Catalan Institute for Water Research (ICRA), 17003 Girona, Spain

[2] Universitat de Girona (UdG), 17003 Girona, Spain

[3] Thermo Fisher Scientific, Runcorn WA7 1TA, United Kingdom

[4] Catalan Institute for Research and Advanced Studies (ICREA), 08010 Barcelona, Spain

[†]Corresponding author: Maria José Farré: phone: (+34) 972 18 33 80, email: mjfarre@icra.cat

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Table S1: Water quality parameters measured during sampling campaign 1 (January 2018). IN=sample taken at the inlet of the DWTP, TR=treated water sample before disinfection, F=treated water after disinfection, DIS=sample taken at the distribution system

DWTP	conductivity (µS/cm)	pH	$N\text{-}NO_2$ (mgN/L)	$N\text{-}NO_3$ (mgN/L)	Cl^- (mg/L)	$N\text{-}NH_4$ (mgN/L)	TOC (mg/L)	TN (mg/L)
DWTP1_IN	81	6.7	<LOQ	0.4	7.7	<LOQ	3.2	0.7
DWTP1_TR	112	7.0	<LOQ	0.7	11.7	<LOQ	1.5	0.8
DWTP1_ F	131	6.0	<LOQ	0.7	13.8	0.2	1.5	1.0
DWTP1_DIS	167	6.9	0.003	0.4	19.8	0.2	1.9	0.9
DWTP2_IN	200	6.7	0.008	0.1	24.6	0.4	4.7	1.0
DWTP2_TR	213	6.5	<LOQ	0.2	29.7	<LOQ	2.5	0.4
DWTP2_ F	245	6.3	0.005	0.2	32.0	0.3	3.4	0.7
DWTP2_DIS	248	6.8	0.005	0.2	31.7	0.3	3.3	0.8
DWTP4_IN	44	6.8	<LOQ	0.1	3.6	<LOQ	3.5	0.4
DWTP4_TR	68	6.8	<LOQ	0.1	6.2	<LOQ	2.2	0.2
DWTP4_F	90	7.1	<LOQ	0.1	8.5	0.3	2.3	0.7
DWTP4_DIS	84	7.5	<LOQ	0.1	7.2	0.2	2.2	0.5
DWTP5_IN	98	6.9	0.005	0.3	5.8	0.2	3.5	0.8
DWTP5_TR	138	7.1	<LOQ	0.3	11.7	0.1	1.4	0.5
DWTP5_F	167	6.7	<LOQ	0.3	13.2	0.5	1.2	0.7
DWTP5_DIS	165	7.8	<LOQ	0.2	13.0	0.3	1.1	0.7

DWTP	conductivity (µS/cm)	pH	$N\text{-}NO_2$ (mgN/L)	$N\text{-}NO_3$ (mgN/L)	Cl^- (mg/L)	$N\text{-}NH_4$ (mgN/L)	TOC (mg/L)	TN (mg/L)
DWTP6_F	123	7.0	<LOQ	0.2	16.3	0.2	1.1	0.6
DWTP6_DIS	126	7.2	<LOQ	0.2	15.9	0.2	1.0	0.5
DWTP7_F	107	6.8	<LOQ	0.1	14.1	0.2	1.9	0.5
DWTP7_DIS	199	6.8	0.003	0.2	25.6	0.2	2.2	0.6
DWTP8_F	121	6.9	<LOQ	0.2	14.6	0.2	1.7	0.7
DWTP8_DIS	122	7.4	<LOQ	0.2	14.8	0.2	1.9	0.6
DWTP9_F	125	7.5	0.003	0.20	16.6	0.28	1.8	0.7
DWTP11_F	187	7.6	0.003	0.48	27.6	0.17	3.7	1.1

LOQ: 0.003 mg $N\text{-}NO_2$/L, 0.002 mg $N\text{-}NO_3$/L, 0.025 mg Cl/L, 0.001 mg$N\text{-}NH_4$/L, 0.05 mg/L TOC, 0.05 mg/L TN, Br^- was not measured above 0.01mg/L.

Table S2: Water quality parameters during sampling campaign 2 (October 2018). IN=sample taken at the inlet of the DWTP, TR=treated water sample before disinfection, F=treated water after disinfection, DIS=sample taken at the distribution system

DWTP	conductivity (µS/cm)	pH	$N\text{-}NO_2$ (mgN/L)	$N\text{-}NO_3$ (mgN/L)	Cl^- (mg/L)	$N\text{-}NH_4$ (mgN/L)	TOC (mg/L)	TN (mg/L)
DWTP2_IN	188.4	5.9	0.006	0.4	27.8	0.02	4.9	0.8
DWTP2_TR	251.3	6.2	<LOQ	0.1	32.9	0.02	2.2	0.3
DWTP2_ F	252.5	6.4	0.008	0.1	34.8	0.20	2.2	0.5
DWTP2_DIS	244.1	6.5	0.010	0.1	33.3	0.19	2.2	0.5
DWTP3_IN	128.8	6.4	<LOQ	0.08	28.0	0.02	2.3	0.3
DWTP3_TR	141.4	6.27	<LOQ	0.07	29.3	<LOQ	1.3	0.2
DWTP3_F	154.8	6.8	<LOQ	0.08	29.9	0.3	1.3	0.5
DWTP3_DIS	174.4	7.2	<LOQ	<LOQ	34.2	0.3	1.4	0.5
DWTP4_IN	45.7	5.23	<LOQ	0.09	4.6	0.03	3.8	0.3
DWTP4_TR	67.1	5.55	<LOQ	0.09	6.7	0.01	2.3	0.2
DWTP4_F	80.9	6.45	<LOQ	0.09	7.6	0.3	2.4	0.5
DWTP5_IN	86.0	6.9	<LOQ	<LOQ	5.7	0.1	2.7	0.3
DWTP5_TR	129.6	6.9	0.003	0.06	9.8	<LOQ	1.7	0.2
DWTP5_F	3291.6	8.9	0.002	0.06	12.9	0.3	1.3	0.6
DWTP5_DIS	158.9	7.4	0.002	0.07	13.5	0.2	0.9	0.4

DWTP	conductivity (µS/cm)	pH	$N\text{-}NO_2$ (mgN/L)	$N\text{-}NO_3$ (mgN/L)	Cl^- (mg/L)	$N\text{-}NH_4$ (mgN/L)	TOC (mg/L)	TN (mg/L)
DWTP6_F	135.2	7.3	0.002	0.5	18.5	0.27	1.6	0.9
DWTP6_DIS	138.7	7.2	0.038	0.5	18.6	0.22	1.7	0.9
DWTP7_F	108.1	7.1	<LOQ	0.2	15.4	0.30	2.3	0.7
DWTP8_F	129.0	7.2	<LOQ	0.3	17.6	0.23	1.9	0.7
DWTP8_DIS	126.3	7.4	0.003	0.2	16.9	0.27	1.9	0.7
DWTP9_F	88.5	7.8	<LOQ	0.1	12.1	0.26	2.7	0.6
DWTP9_DIS	95.5	8.2	0.004	0.2	12.7	0.26	1.8	0.6
DWTP10_DIS	81.0	7.8	<LOQ	0.08	10.6	0.27	2.2	0.6
DWTP11_DIS	183.9	7.3	0.021	0.3	30.4	0.14	2.8	0.6

LOQ: 0.003 mg $N\text{-}NO_2$/L, 0.002 mg $N\text{-}NO_3$/L, 0.025 mg Cl/L, 0.001 mg$N\text{-}NH_4$/L, 0.05 mg/L TOC, 0.05 mg/L TN, Br^- was not measured above 0.01mg/L.

Table S3. Water quality parameters measured during additional sampling campaigns at DWTP2 (June 2015)

Sample code	pH	Conductivity (µS/cm)	TOC (mgC/L)	TN (mgN/L)	$N\text{-}NO_2$ (mg N/L)	$N\text{-}NO_3$ (mg N/L)	$N\text{-}NH_4$ (mgN/L)	NDMA FP (ng/L)	St dev (NDMA FP)
S1-inlet	7.2	307	5.6	1.9	0.008	1.6	0.01	39.2	3.3
S2-inlet	7.0	305	5.6	1.9	0.007	1.6	<LOQ	45.9	2.4
S3- pre-ozone	6.8	346	3.8	1.8	<LOQ	1.5	0.04	14.3	1.3
S4-prechlorine	6.5	334	3.2	1.7	<LOQ	1.5	0.00	12.3	1.1
S5- sand filtration	6.4	339	3.3	1.8	<LOQ	1.5	0.01	16.3	1.5
S6- GAC	6.4	334	3.0	1.8	<LOQ	1.5	0.01	13.3	1.5
S7-final	6.6	359	2.7	2.1	<LOQ	1.6	0.34	10.3	0.2

LOQ: 0.003 mg $N\text{-}NO_2$/L, 0.002 mg $N\text{-}NO_3$/L, 0.025 mgCl/L, 0.001 mg$N\text{-}NH_4$/L.

Table S4. Water quality parameters measured during additional sampling campaigns at DWTP2 (September 2015)

Sample code	pH	Conductivity (µS/cm)	TOC (mgC/L)	TN (mgN/L)	$N\text{-}NO_2$ (mg N/L)	$N\text{-}NO_3$ (mg N/L)	$N\text{-}NH_4$ (mgN/L)	NDMA FP (ng/L)	St dev (NDMA FP)
S1-inlet	5.4	332	7.1	1.5	<LOQ	0.00	0.81	34.4	3.4
S2- pre-ozone	7.1	335	6.7	1.6	<LOQ	0.02	0.81	14.0	0.6
S3-coag.	6.6	361	4.8	1.1	<LOQ	0.01	0.76	14.4	0.2
S4-sand filtration	6.1	375	4.7	0.4	<LOQ	0.02	0.01	14.3	0.8
S6- GAC	5.6	369	4.2	0.4	<LOQ	0.03	0.03	10.7	1.1
S7-final	5.8	381	3.9	0.9	<LOQ	0.03	0.54	11.9	0.7
S7_B- final no FP	5.8	381	3.9	0.9	<LOQ	0.03	0.54	1.2	0.3

LOQ: 0.003 mg $N\text{-}NO_2$/L, 0.002 mg $N\text{-}NO_3$/L, 0.025 mgCl/L, 0.001 mg$N\text{-}NH_4$/L.

Table S5. Water quality parameters measured during additional sampling campaigns at DWTP2 (September 2015)

Sample code	pH	Conductivity (µS/cm)	TOC (mgC/L)	TN (mgN/L)	$N\text{-}NO_2$ (mg N/L)	$N\text{-}NO_3$ (mg N/L)	$N\text{-}NH_4$ (mgN/L)	NDMA FP (ng/L)	St dev (NDMA FP)
S1-inlet	8.0	314	8.6	1.0	0.008	0.02	0.30	26.5	0.5
S2- preozone	8.9	325	8.1	0.9	0.004	0.02	0.23	12.7	0.5
S3- coag.+ClO_2+filt	7.4	345	4.6	0.3	<LOQ	0.03	<LOQ	20.1	1.3
S4- main ozone	6.6	354	4.5	0.4	<LOQ	0.04	0.07	17.4	0.5
S5- GAC	6.0	355	4.0	0.4	<LOQ	0.04	0.04	11.1	0.8

LOQ: 0.003 mg $N\text{-}NO_2$/L, 0.002 mg $N\text{-}NO_3$/L, 0.025 mgCl/L, 0.001 mg$N\text{-}NH_4$/L.