

Supporting Information

Spatial/Temporal Distribution and Multi-Pathway Cancer Risk Assessment of Trihalomethanes in Low TOC and High Bromide Groundwaters

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Table S1. Sampling points at storage tank and distribution system

Storage Tank No	Storage Name	Tank	Dist. No	Distribution Name	Dist. No	Distribution Name
S1	YesilS.		D1	Selimiye D.	D17	Sirintepe D.
S2	KeykubatS.		D2	AliyeTarman D.	D18	Demokrasi D.
S3	AnnelerParkiS.		D3	Sanayi D.	D19	Melikgazi D.
S4	KonaklarS.		D4	Osman Kavuncu D.	D20	K.Mustafa D.
S5	MahrumlarS1.		D5	Selimiye D.	D21	Kilicaslan D.
S6	KulakliS.		D6	Gulistanevler D.	D22	Yeni D.
S7	MahrumlarS2.		D7	Esenyurt D.	D23	Ahi Evran D.
S8	Yeni Role S.		D8	Mevlana D.	D24	Yildizevler D.
S9	GedirisS.		D9	Harman D.	D25	Zumrut D.
S10	Ali DagiS.		D10	Caybaglari D.	D26	Kosk D.
S11	EgribucakS.		D11	Yenikoy D.	D27	Hisarcik D.
S12	MezbahaneS.		D12	Selcuklu D.	D28	ZiyaGokalp D.
S13	BestepelerS.		D13	Egribucak D.	D29	Beyazsehir D.
S14	HoyukS.		D14	Hacilar D.	D30	Cirgalan D.
S15	SerkentS.		D15	Yenidogan D.	D31	Mimarsinan D.
S16	BostanderesiS.		D16	Cumhuriyet D.	D32	Alsancak D.
S17	Talas S.					
S18	KayabagS.					

Table S2. Input parameters in exposure assessment of THMs

Parameters	Unit	Value		Data source
		Male	Female	
Ingestion rate (IR _w)	L/d	2		Genisoglu <i>et al.</i> ²⁹
Exposure frequency (EF)	d/y	365		
Exposure duration (ED)	Y	75.6	81	TSI ⁴⁶
Body weight (BW)	Kg	77.4	68.4	TSI ⁴⁶
Average time (AT)	D	75.6×365	81×365	TSI ⁴⁶
Skin area (SA)	cm ²	18900	17700	TSI ⁴⁶
Permeability constant in water (PC)	cm/h	0.0089 (TCM)		Zhang <i>et al.</i> ²⁴
		0.0058 (BDCM)		
		0.0039 (DBCM)		
		0.0026 (TBM)		
Exposure time (ET)	h/day	0.12	0.13	Zhang <i>et al.</i> ²⁶
Inhalation rate (IR _a)	m ³ /h	0.84	0.66	Pan <i>et al.</i> ⁴⁷

Table S3. Slope factors of BDCM, DBCM and TBM.

THM Specie	Slope factors (mg/kg/day) ⁻¹		
	Oral ingestion	Dermal absorption	Inhalation
TCM	0.0061 ^a	0.0305 ^a	0.0805 ^a
BDCM	0.062 ^a	0.0633 ^b	0.062 ^c
DBCM	0.084 ^a	0.14 ^b	0.084 ^c
TBM	0.0079 ^a	0.0132 ^b	0.00385 ^a

^aThe values provided in IRIS (IRIS⁴⁹; Basu *et al.*³⁰; Zhang *et al.*²⁴)

^bThe values provided in Risk Assessment Information System (RAIS⁵⁰; Zhang *et al.*²⁶)

^c Inhalation SFs of BDCM and DBCM were presumed to be equal to the SFs for oral ingestion similar to earlier studies (Siddique *et al.*⁴³; Zhang *et al.*²⁶)

Table S4. Water quality characteristics of storage tanks

Storage Tank No	pH	EC (µS/cm)	Sulfate (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Total Hardness (mg/L)	Alkalinity (mg/L)	TOC (mg/L)	Free Chlorine (mg/L)	Bromine (µg/L)
S1	7.3	548	58	0.19	27	158	179	0.79	0.2	380
S2	7.1	573	45	0.20	16	173	179	0.63	0.2	260
S3	7.4	276	13	0.23	12	108	130	0.58	0.3	80
S4	7.4	276	13	0.24	12	106	117	0.62	0.2	270
S5	7.1	382	31	0.19	38	135	125	0.69	0.3	80
S6	7.1	379	31	0.19	37	126	126	0.74	0.3	340
S7	7.1	368	29	0.19	35	125	120	0.72	0.2	380
S8	7.4	341	17	0.16	17	131	150	0.54	0.2	240
S9	7.3	360	21	0.15	23	143	143	0.55	0.2	360
S10	7.3	342	19	0.15	19	133	139	0.45	0.2	320
S11	7.5	210	17	0.19	13	89	79	0.78	0.2	340
S12	7.4	208	14	0.14	13	87	80	0.59	0.1	40
S13	7.3	207	12	0.31	9	88	97	0.57	0.3	80
S14	7.5	444	9	0.15	7	197	234	0.39	0.2	80
S15	7.4	302	13	0.17	13	118	131	0.40	0.3	40
S16	7.4	317	10	0.15	14	139	151	0.38	0.2	80
S17	7.3	265	11	0.21	11	105	117	0.74	0.3	40
S18	7.4	255	11	0.20	11	105	118	0.74	0.2	40
Minimum	7.1	207	9	0.14	7	87	79	0.38	0.1	40
Maximum	7.5	573	58	0.31	38	197	234	0.79	0.3	380
Average	7.3	336	21	0.19	18	126	134	0.60	0.2	192
Median	7.3	329	15	0.19	13	125	128	0.60	0.2	160
10 th Percentile	7.1	209	11	0.15	10	89	92	0.40	0.2	40
90 th Percentile	7.4	475	35	0.23	35	162	179	0.75	0.3	366
Standard Deviation	0.1	105	13	0.04	10	30	37	0.14	0.03	139

Table S5. Water quality characteristics of distribution points

Dist. No	pH	EC ($\mu\text{S/cm}$)	Sulfate (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Total Hardness (mg/L)	Alkalinity (mg/L)	TOC (mg/L)	Free Chlorine (mg/L)	Bromine ($\mu\text{g/L}$)
D1	7.3	552	58	0.18	27	174	176	0.60	0.2	80
D2	7.2	549	57	0.17	27	177	172	0.60	0.2	160
D3	7.3	411	35	0.20	28	145	138	0.50	0.2	260
D4	7.4	347	27	0.21	31	127	116	0.50	0.2	370
D5	7.5	325	26	0.22	28	119	119	0.52	0.2	75
D6	7.4	338	18	0.19	20	133	138	0.55	0.2	80
D7	7.3	358	22	0.17	24	143	147	0.47	0.2	160
D8	7.4	324	17	0.18	18	129	136	0.41	0.2	270
D9	7.4	344	18	0.17	20	137	147	0.46	0.2	80
D10	7.4	337	18	0.19	19	126	144	0.46	0.2	40
D11	7.1	359	29	0.22	33	138	120	0.73	0.3	80
D12	7.5	214	17	0.20	13	88	74	0.58	0.2	220
D13	7.4	215	17	0.20	13	87	78	0.59	0.2	110
D14	7.4	196	12	0.16	13	79	76	0.47	0.2	170
D15	7.5	330	18	0.19	19	128	127	0.34	0.2	340
D16	7.3	278	13	0.20	12	113	119	0.32	0.3	80
D17	7.3	275	13	0.22	12	111	132	0.30	0.3	300
D18	7.3	324	10	0.18	13	126	154	0.29	0.3	380
D19	7.4	248	11	0.25	11	103	117	0.32	0.3	270
D20	7.3	396	34	0.22	29	141	136	0.48	0.2	75
D21	7.5	250	11	0.24	11	107	118	0.35	0.3	190
D22	7.2	547	41	0.19	17	174	192	0.48	0.2	380
D23	7.3	274	13	0.20	12	120	139	0.38	0.3	150
D24	7.3	260	12	0.23	11	106	120	0.40	0.3	120
D25	7.1	555	42	0.19	17	176	179	0.43	0.3	370
D26	7.4	250	11	0.24	11	102	122	0.33	0.3	180
D27	7.4	146	5	0.10	7	77	67	0.51	0.3	90
D28	7.0	557	43	0.18	17	174	179	0.49	0.2	260
D29	7.3	273	13	0.21	12	118	127	0.40	0.3	380
D30	7.3	275	13	0.21	12	118	125	0.32	0.3	240
D31	7.3	247	11	0.23	11	100	119	0.44	0.3	70
D32	7.3	275	13	0.21	12	118	127	0.39	0.3	80
Minimum	7.0	146	5	0.10	7	77	67	0.29	0.2	40
Maximum	7.5	557	58	0.25	33	177	192	0.73	0.3	380
Average	7.3	332	22	0.20	18	125	131	0.45	0.3	191
Median	7.3	324	17	0.20	15	123	127	0.46	0.2	165

10 th Percentiles	7.2	218	11	0.17	11	89	82	0.32	0.2	76
90 th Percentiles	7.5	549	42	0.23	28	174	176	0.59	0.3	370
Standard Deviation	0.1	112	14	0.03	7	28	30	0.13	0.03	113

Table S6. Annual average, minimum, maximum, median, 10th and 90th percentiles of THM species in storage tanks during 12 months of sampling

Storage T. No^a	TCM (µg/L)	BDCM (µg/L)	DBC (µg/L)	TBM (µg/L)
S1	0.9	0.6	2.9	2.3
S2	1.0	0.5	2.6	1.7
S3	1.1	0.8	2.8	1.0
S4	1.0	0.6	2.7	1.0
S5	1.3	1.3	4.5	1.9
S6	1.1	1.1	3.8	1.8
S7	1.1	1.1	4.0	2.1
S8	1.1	0.6	2.9	2.2
S9	1.4	1.1	3.9	2.2
S10	1.1	0.8	3.8	2.6
S11	1.1	1.1	3.9	1.7
S12	1.0	0.5	2.1	1.1
S13	1.0	0.5	2.4	1.3
S14	1.1	0.7	2.5	0.9
S15	1.1	0.6	2.1	1.0
S16	1.1	0.6	2.2	1.4
S17	1.1	0.7	2.8	1.3
S18	0.9	0.5	2.3	0.8
Minimum	0.9	0.5	2.1	0.8
Maximum	1.4	1.3	4.5	2.6
Average	1.1	0.8	3.0	1.6
Median	1.1	0.7	2.8	1.6
10 th Percentiles	1.0	0.5	2.1	1.0
90 th Percentiles	1.2	1.1	3.9	2.3
Standard Deviation	0.1	0.3	0.8	0.6

Table S7 Annual average, minimum, maximum, median, 10th and 90th percentiles of THM species in distribution points during 12 months of sampling

Distr. No^b	TCM (µg/L)	BDCM (µg/L)	DBCМ(µg/L)	TBM (µg/L)
D1	1.0	0.8	3.6	2.3
D2	1.0	0.8	3.5	2.2
D3	1.0	1.1	4.5	2.9
D4	0.9	1.3	4.3	2.3
D5	0.7	0.9	4.0	2.5
D6	1.0	0.7	3.0	2.4
D7	1.2	1.2	3.0	1.7
D8	1.3	0.7	3.5	2.1
D9	1.0	0.8	3.8	2.7
D10	3.0	1.0	3.9	2.7
D11	1.2	1.2	4.1	2.3
D12	1.9	1.6	4.8	2.4
D13	1.1	1.3	4.1	1.9
D14	2.1	1.3	2.7	0.7
D15	1.4	0.7	3.4	2.3
D16	0.7	2.2	3.7	1.3
D17	1.0	0.6	2.6	1.6
D18	1.0	0.8	2.3	1.4
D19	0.8	0.7	2.4	0.9
D20	1.0	1.1	4.5	2.8
D21	1.3	1.2	3.1	1.0
D22	0.6	0.5	2.9	2.1
D23	0.7	0.6	2.6	1.4
D24	1.2	0.8	2.6	1.0
D25	0.7	0.6	2.7	1.5
D26	0.9	1.0	2.9	1.0
D27	3.5	1.6	2.3	0.6
D28	0.8	0.6	2.5	1.2
D29	0.6	0.7	2.6	1.2
D30	0.6	0.8	3.2	1.3
D31	0.8	0.7	2.8	0.9
D32	0.7	0.5	2.4	1.1
Minimum	0.6	0.5	2.3	0.6
Maximum	3.5	2.2	4.8	2.9
Average	1.1	0.9	3.3	1.7
Median	1.0	0.8	3.1	1.7
10 th Percentiles	0.7	0.6	2.4	1.0
90 th Percentiles	1.9	1.3	4.3	2.7
Standard Deviation	0.7	0.4	0.7	0.7

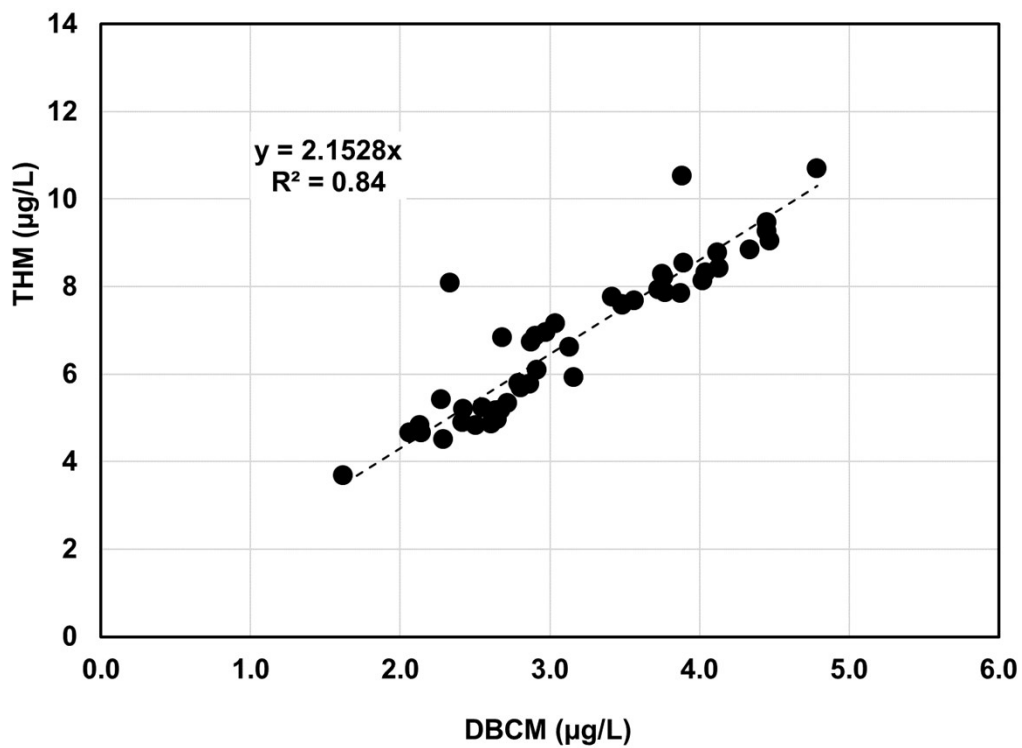


Figure S1. Correlation between the annual average concentrations of DBCM and THMs.