SI: Removal efficiency of point of use water filters for DBPs and toxicity from chlorinated and chloraminated tap water

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Table S1. Filter types used in the study.

	filter type	filter technique	Filter manufacturer	cartridge model, manufacturer	filtered water volume before sampling	recommended lifetime of the filter cartridge
Filter A	pressure filter	activated carbon and reverse osmosis	PureH2gO (Australia)	n.a.	≈1000 L	n.a.
Filter B	gravity filter	ceramic outer shell with granular activated carbon (coconut shell	Southern Cross Pottery (Australia)	SCP Fluoride Plus™, KLT Filtration (UK)	≈500 L	12 months, 2000 L
Filter C	gravity filter	ceramic and activated carbon (coconut shell based)	Waters Co Ltd (South Korea)	Waterman 600 mL Portable Filter (Waters Co Ltd)	≈150 L	6 months, 800 L
Filter D	pressure filter	polypropylene cartridge with subsequent carbon block (coconut shell based)	Filtered Water Solutions (Australia)	Twin Undersink with 1 micron Sediment Filter and 0.5 micron Carbon Filter (Filtered Water Solutions)	≈1000 L	12 months, 5000 L
Filter E	gravity filter	ceramic outer shell with granular activated carbon core	local pottery (Australia)	Supersterasyl, Royal Doulton (UK)	≈2000 L	12 months, 2000 L
Filter F	gravity filter	ceramic and activated carbon (coconut shell based)	Healthy H2O (Australia)	two-layer activated carbon cartridge with ceramic filter plate (Healthy H2O)	≈20 L	12 months, 2000 L
Filter G	gravity filter	activated carbon (coconut shell based) and ion-exchange resin	Brita Filter (Germany)	Navelia Filter with Maxtra cartridge (Brita)	≈100 L	4 weeks, 100 L
Filter H	pressure filter	carbon block	Culligan Water (Australia)	Zip Hydrotap BC Series with EV9617-24 filter cartridge (Everpure, USA)	≈2000 L	12 months, 2835 L
Filter I	pressure filter	fluoride filter, no carbon	Puretec (Australia)	cartridge FL051 (Puretec)	≈500 L	12 months, 1900 L
Filter J	pressure filter	carbon block	Billi (Australia)	Billi Quadra 440 with filter cartridge 994001 (Billi)	≈500 L	12 months, 30,000 L
Filter K	pressure filter	carbon block	The Water Shop	Doulton ultracarb standard	≈3000 L	12 months, 4000 L

Table S2. Concentrations of adsorbable organic chloride (AOCl), bromide (AOBr), and iodide (AOI), as well as inorganic fluoride in µg/L Cl^-, Br^-, I^-, and F^- before (tap) and after different water filters (Table S1); for filters D, E, G, and H results are given before (filtered) and after replacement of the filter cartridge (new cartridge); displayed is the arithmetic mean (m) ± standard deviation (sd); Δtap (%) is the average removal through filtration (equations 1 and 2, main manuscript).

	before cartridge exchange								**new cartridge**							
	tap			**filtered**			**Δtap (%)**		**tap**			**filtered**			**Δtap (%)**	
	m	**sd**	**n**	**m**	**sd**	**n**	**m**	**sd**	**m**	**sd**	**n**	**m**	**sd**	**n**	**m**	**sd**
Filter A																
AOCl (µg/L Cl^-)	113.6	3.1	4	6.6	2.7	4	**94%**	2%								
AOBr (µg/L Br^-)	57.4	1.6	4	0.9	0.0	4	**98%**	0%								
AOI (µg/L I^-)	3.2	0.1	4	<0.7		4	**100%**	0%								
fluoride (µg/F^-)	948.5	14.7	2	105.1	9.5	2	**88%**	1%								
Filter B																
AOCl (µg/L Cl^-)	130.0	48.3	4	8.8	6.9	4	**94%**	4%								
AOBr (µg/L Br^-)	22.1	4.6	4	<0.3		4	**100%**	0%								
AOI (µg/L I^-)	3.2	2.2	4	<0.7		4	**100%**	0%								
fluoride (µg/F^-)	925.3	127.6	2	125.6	7.6	2	**87%**	3%								
Filter C																
AOCl (µg/L Cl^-)	133.9	37.6	4	35.8	16.1	4	**74%**	8%								
AOBr (µg/L Br^-)	33.8	50.2	4	1.5	2.1	4	**95%**	7%								
AOI (µg/L I^-)	3.5	1.7	4	0.4	0.8	4	**92%**	18%								
fluoride (µg/F^-)	922.6	104.3	4	720.1	161.2	4	**22%**	11%								
Filter D																
AOCl (µg/L Cl^-)	154.6	8.2	2	94.0	3.9	2	**39%**	1%	154.6	8.2	2	44.7	0.6	2	**71%**	2%
AOBr (µg/L Br^-)	66.0	55.7	2	13.9	0.4	2	**79%**	1%	66.0	2.5	2	7.7	0.1	2	**88%**	0%
AOI (µg/L I^-)	14.4	1.0	2	3.9	0.3	2	**72%**	4%	14.4	1.0	2	2.1	0.5	2	**85%**	3%
fluoride (µg/F^-)	850.4	27.6	2	835.0	35.8	2	**2%**	1%	850.4	27.6	2	777.7	47.7	2	**9%**	3%
Filter E																
AOCl (µg/L Cl^-)	235.4	29.0	4	111.6	12.6	4	**53%**	2%	252.4	3.3	5	50.4	41.9	5	**80%**	17%
AOBr (µg/L Br^-)	140.0	62.6	4	35.5	6.3	4	**74%**	6%	156.9	44.8	5	15.7	9.3	5	**90%**	6%
AOI (µg/L I^-)	9.3	2.2	4	6.1	1.2	4	**34%**	13%	10.7	3.6	5	2.7	1.2	5	**74%**	14%
fluoride (µg/F^-)	783.9	38.5	4	753.8	17.8	4	**4%**	3%	865.1	6.7	2	847.3	23.2	2	**2%**	2%

Filter F															
AOCl (µg/L Cl^-)	143.1	8.9	4	59.4	2.9	4	**58%**	3%							
AOBr (µg/L Br^-)	30.4	2.8	4	7.8	0.6	4	**74%**	1%							
AOI (µg/L I^-)	3.4	1.9	4	1.7	0.2	4	**40%**	30%							
fluoride (µg/F^-)	974.7	1.4	2	925.7	1.0	2	**5%**	0%							
Filter G															
AOCl (µg/L Cl^-)	168.7	66.6	4	134.5	52.5	4	**19%**	13%	191.0	60.6	3	96.6	32.4	3	**50%**	1%
AOBr (µg/L Br^-)	60.4	76.4	4	40.4	7.3	4	**33%**	11%	63.2	9.3	3	23.6	4.0	3	**63%**	1%
AOI (µg/L I^-)	8.0	0.8	4	6.8	0.8	4	**15%**	1%	6.7	1.4	3	5.5	3.3	3	**26%**	23%
fluoride (µg/F^-)	781.8	2.5	3	763.4	8.6	3	**2%**	1%	781.8	2.5	3	799.1	72.7	3	**-2%**	9%
Filter H															
AOCl (µg/L Cl^-)	147.9	21.5	5	107.9	15.4	5	**26%**	12%	140.1	29.6	4	77.0	13.8	4	**43%**	17%
AOBr (µg/L Br^-)	66.6	17.5	5	39.1	12.6	5	**41%**	14%	68.4	17.1	4	18.2	5.2	4	**72%**	10%
AOI (µg/L I^-)	7.3	1.7	5	4.9	0.8	5	**32%**	15%	8.9	1.8	4	5.5	0.1	4	**36%**	13%
fluoride (µg/F^-)	774.6	8.8	5	764.0	45.9	5	**2%**	6%	696.4	41.5	4	710.5	41.5	4	**-2%**	12%
Filter I															
AOCl (µg/L Cl^-)	138.2	14.8	2	84.2	9.0	6	**39%**	8%							
AOBr (µg/L Br^-)	61.7	1.2	2	44.6	5.8	6	**28%**	9%							
AOI (µg/L I^-)	6.6	1.3	2	4.4	0.4	6	**33%**	11%							
fluoride (µg/F^-)	957.9	6.4	2	160.9	28.5	6	**83%**	3%							
Filter J															
AOCl (µg/L Cl^-)	154.0	115.6	3	122.1	76.2	3	**30%**	9%							
AOBr (µg/L Br^-)	69.7	64.0	3	40.4	29.2	3	**35%**	12%							
AOI (µg/L I^-)	6.5	3.6	3	6.1	4.1	3	**10%**	9%							
fluoride (µg/F^-)	934.8	23.6	2	934.9	2.1	2	**0%**	2%							
Filter K															
AOCl (µg/L Cl^-)	128.2	28.1	4	76.7	6.6	4	**39%**	10%							
AOBr (µg/L Br^-)	46.2	5.3	4	21.3	1.2	4	**53%**	6%							
AOI (µg/L I^-)	4.7	1.1	4	3.1	0.8	4	**32%**	19%							
fluoride (µg/F^-)	956.6		1	937.4		1	**2%**								

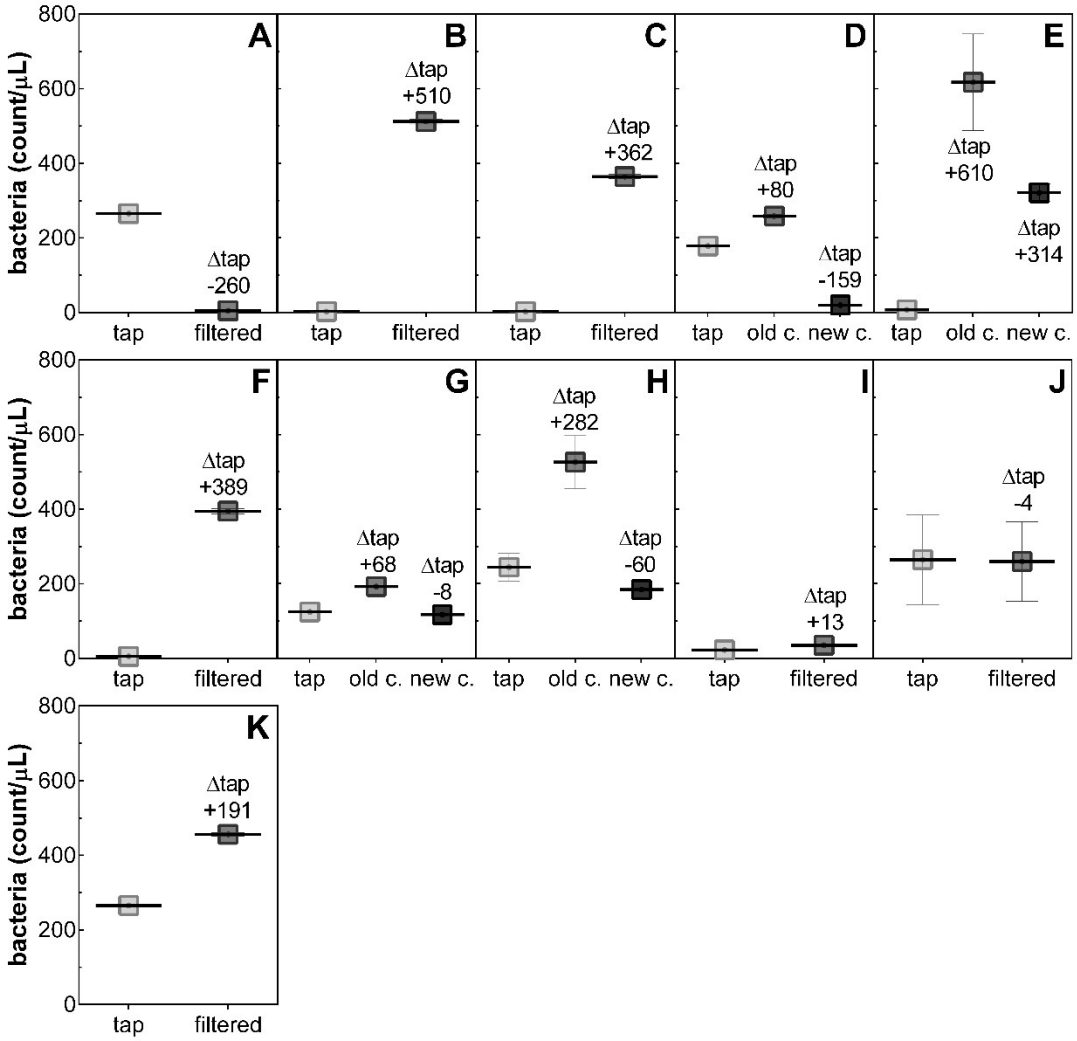

Figure S1. Bacteria counts before (tap) and after different water filters (Table S1) using flow cytometry with SYBR green I; for filter D, E, G, H results are given before (old c.) and after replacement of the filter cartridge (new c.). Displayed is the median and the whiskers extend from minimum to maximum (n = 2 – 8). Detailed results are given in Table S3.

Table S3. Bacteria counts per µL analyzed using flow cytometry before (tap) and after different water filters (Table S1); for filters D, E, G, and H results are given before (filtered) and after replacement of the filter cartridge (new cartridge); displayed is the arithmetic mean (m) ± standard deviation (sd); Δtap is the average absolute bacteria removal (−) or increase (+) through filtration (equation 3, main manuscript).

	before cartridge exchange							**new cartridge**						
	tap			**filtered**			**Δtap**	**tap**			**filtered**			**Δtap**
	m	**sd**	**n**	**m**	**sd**	**n**	**(count/µL)**	**m**	**sd**	**n**	**m**	**sd**	**n**	**(count/µL)**
Filter A	265	2.8	3	4.9	1	3	-260							
Filter B	2.1	2	3	512	6.4	3	+510							
Filter C	2.1	2	3	364	6.3	3	+362							
Filter D	178	1.8	3	258	4.6	3	+80	178	1.8	3	20	3.1	3	-159
Filter E	6.8	1.4	6	617	129	3	+610	6.76	1.4	6	321	24	3	+314
Filter F	5.6	1.6	3	395	7.1	3	+389							
Filter G	125	0.7	3	192	2.1	3	+68	125	0.7	3	117	1.1	3	-8
Filter H	244	38	8	526	70	5	+282	244	38	8	184	2.6	3	-60
Filter I	22	0.6	3	35	0.7	3	+13							
Filter J	264	121	2	260	107	2	-4							
Filter K	265	2.8	3	456	4.6	3	+191							

Table S4. Bioassay results for cytotoxicity (Microtox), oxidative stress response induction (AREc32), genotoxicity (umuC), and estrogenicity (BG1) before (tap) and after different water filters (Table S1) in units of relative enrichment factor (REF); for filters D, E, G, and H results are given before (filtered) and after replacement of the filter cartridge (new cartridge); displayed is the arithmetic mean (m) ± standard deviation (sd); Δtap (%) is the average effect removal through filtration (equation 4, main manuscript). BEQ is the bioanalytical equivalent concentration.

	before cartridge exchange									new cartridge				
	tap				filtered				Δtap	filtered				Δtap
	m	sd	n	BEQ	m	sd	n	BEQ	(%)	m	sd	n	BEQ	(%)
Filter A														
Microtox, EC_{50} (REF)	14.3	8.9	6	2.E-04	168.7	61.6	6	2.E-05	**92%**					
AREc32, $EC_{IR1.5}$ (REF)	3.1	1.1	6	3.E-07	220.2	83.1	6	4.E-09	**99%**					
umuC, $EC_{IR1.5}$ (REF)	36.0	17.1	6	3.E-09	256.5	158.6	6	4.E-10	**84%**					
Filter B														
Microtox, EC_{50} (REF)	22.7	1.5	4	1.E-04	113.7	7.7	4	3.E-05	**80%**					
AREc32, $EC_{IR1.5}$ (REF)	19.1	5.7	4	5.E-08	220.2	83.1	4	1.E-09	**100%**					
umuC, $EC_{IR1.5}$ (REF)	63.1	8.9	4	2.E-09	629.1	639.7	4	2.E-10	**84%**					
Filter C														
Microtox, EC_{50} (REF)	22.7	1.5	4	1.E-04	62.9	1.8	4	5.E-05	**64%**					
AREc32, $EC_{IR1.5}$ (REF)	19.1	5.7	4	5.E-08	85.5	33.0	4	1.E-08	**78%**					
umuC, $EC_{IR1.5}$ (REF)	63.1	8.9	4	2.E-09	189.7	50.0	4	6.E-10	**65%**					
Filter D														
Microtox, EC_{50} (REF)	15.1	0.2	4	2.E-04	40.2	0.4	4	8.E-05	**62%**	91.0	8.6	4	3.E-05	**83%**
AREc32, $EC_{IR1.5}$ (REF)	2.7	0.0	4	3.E-07	9.0	0.1	4	1.E-07	**70%**	78.7	6.6	4	1.E-08	**97%**
umuC, $EC_{IR1.5}$ (REF)	36.0	4.3	4	3.E-09	74.6	2.3	4	1.E-09	**51%**	111.0	59.3	4	1.E-09	**65%**
Filter E														
Microtox, EC_{50} (REF)	17.6	6.1	8	2.E-04	57.6	52.8	6	6.E-05	**69%**	72.1	16.2	8	4.E-05	**75%**
AREc32, $EC_{IR1.5}$ (REF)	4.3	2.1	8	2.E-07	12.6	9.5	8	7.E-08	**55%**	25.3	5.0	8	4.E-08	**86%**
umuC, $EC_{IR1.5}$ (REF)	29.4	10.0	8	4.E-09	91.2	45.1	8	1.E-09	**74%**	196.6	77.3	8	6.E-10	**85%**
Filter F														
Microtox, EC_{50} (REF)	11.4	1.0	4	3.E-04	29.3	4.8	4	1.E-04	**61%**					
AREc32, $EC_{IR1.5}$ (REF)	7.4	2.0	4	1.E-07	12.3	1.6	4	7.E-08	**44%**					
umuC, $EC_{IR1.5}$ (REF)	33.8	3.0	4	3.E-09	91.8	3.0	4	1.E-09	**61%**					

Filter G														
Microtox, EC_{50} (REF)	30.8	11.5	8	1.E-04	47.7	9.1	8	7.E-05	**36%**	74.1	22.3	8	4.E-05	**56%**
AREc32, $EC_{IR1.5}$ (REF)	7.4	2.0	8	1.E-07	9.9	4.9	8	9.E-08	**22%**	11.6	6.0	8	8.E-08	**31%**
umuC, $EC_{IR1.5}$ (REF)	47.4	13.3	8	2.E-09	89.1	48.7	8	1.E-09	**46%**	149.7	29.8	8	7.E-10	**69%**
Filter H														
Microtox, EC_{50} (REF)	28.0	6.4	10	1.E-04	51.7	12.2	5	6.E-05	**48%**	106.8	26.5	5	3.E-05	**70%**
AREc32, $EC_{IR1.5}$ (REF)	8.9	3.0	10	1.E-07	14.9	8.3	5	6.E-08	**36%**	31.1	18.1	5	3.E-08	**63%**
umuC, $EC_{IR1.5}$ (REF)	65.1	18.5	10	2.E-09	117.2	77.3	5	9.E-10	**38%**	410.0	40.1	5	3.E-10	**69%**
Filter I														
Microtox, EC_{50} (REF)	10.3	1.3	4	3.E-04	13.8	4.5	6	2.E-04	**25%**					
AREc32, $EC_{IR1.5}$ (REF)	3.7	0.7	4	2.E-07	7.4	3.0	6	1.E-07	**47%**					
umuC, $EC_{IR1.5}$ (REF)	38.8	4.4	4	3.E-09	61.9	35.4	6	2.E-09	**28%**					
Filter J														
Microtox, EC_{50} (REF)	19.0	2.5	4	2.E-04	70.0	7.2	4	5.E-05	**73%**					
AREc32, $EC_{IR1.5}$ (REF)	4.8	1.3	4	2.E-07	15.8	3.3	4	6.E-08	**69%**					
umuC, $EC_{IR1.5}$ (REF)	46.1	16.5	4	2.E-09	186.7	87.1	4	6.E-10	**75%**					

Reference	**m**	**sd**	**n**
Microtox, phenol, EC_{50} (M)	3.2E-03	3.1E-04	10
AREc32, tBHQ, $EC_{IR1.5}$ (M)	9.1E-07	4.3E-08	10
umuC, 4NQO, $EC_{IR1.5}$ (M)	1.1E-07	2.7E-08	10

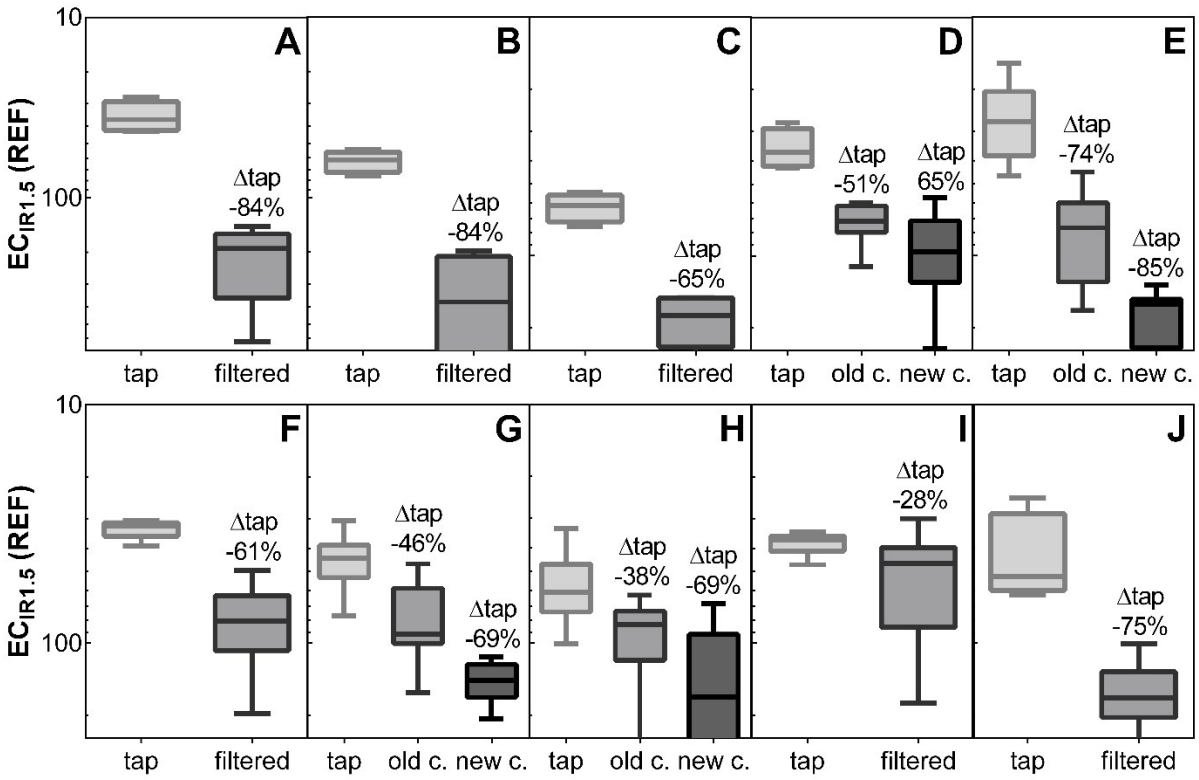

Figure S2. Genotoxicity assessed with the umuC assay: induction ratio of 1.5 ($EC_{IR1.5}$) as relative enrichment factor (REF) before (tap) and after different water filters (Table S1); for filter D, E, G, H results are given before (old c.) and after replacement of the filter cartridge (new c.). Displayed is the median, box extends from the 25th to the 75th percentiles, and the whiskers from minimum to maximum (n = 4 – 10). Detailed results are given in Table S4.