

Supplementary Information

Determination of Parabens in Surface Water from Mogi Guaçu River (São Paulo, Brazil) Using Dispersive Liquid-Liquid Microextraction Based on Low Density Solvent and LC-DAD

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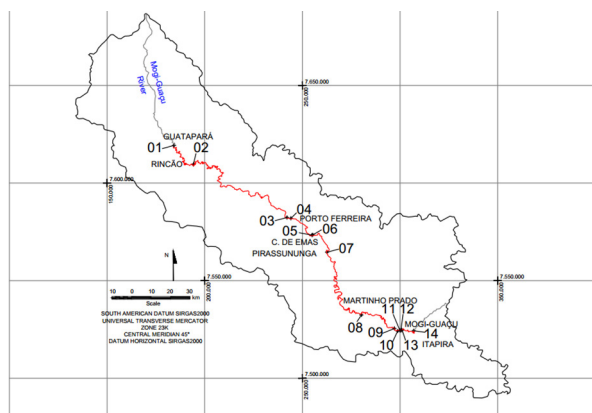


Figure S1. Sampling sites in Mogi Guaçu River.

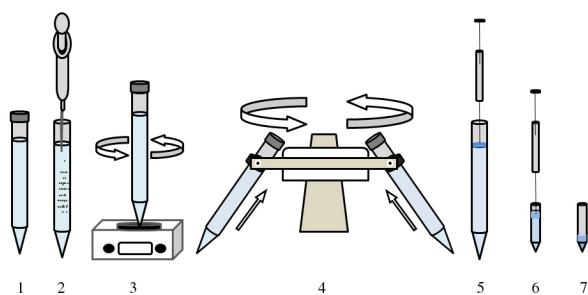


Figure S2. Steps of DLLME based on low density solvent. 1: sample solution containing analytes (parabens) and NaCl; 2: rapid injection of dispersive (acetone) and extraction (1-octanol) solvent; 3: shaken by a vortex mixer for 2 minutes (2000 rpm); 4: centrifugation for 2 min (2000 rpm); 5: removal of 1-octanol with some aqueous phase by a glass microsyringe; 6: removal of 1-octanol by a glass microsyringe; 7: 1-octanol with extracted parabens, ready for analyses by LC-DAD.

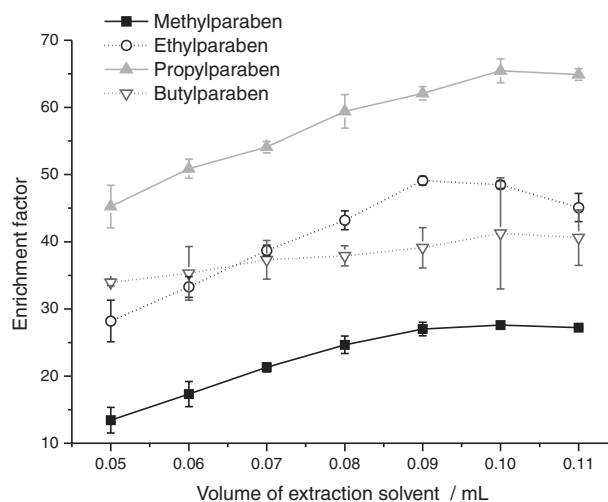


Figure S3. Effect of the volume of the extraction solvent. Extraction condition: parabens concentration = $50 \mu\text{g L}^{-1}$; water sample volume = 10.0 mL; volume of acetone = 1.0 mL; pH = not adjusted; NaCl concentration = 10% (m/v); extraction time = 2 minutes; centrifugation time = 5 minutes; speed = 2000 rpm.

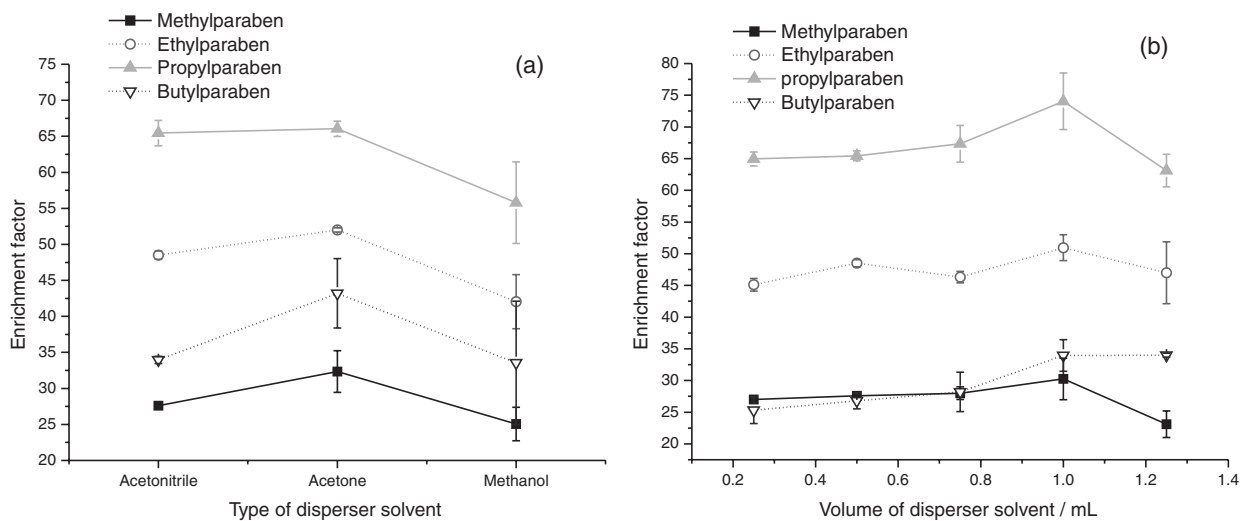


Figure S4. Effect of (a) type and (b) volume of the disperser solvent. Extraction condition: parabens concentration = $50 \mu\text{g L}^{-1}$; water sample volume = 10.0 mL; volume of 1-octanol = 0.1 mL; pH = not adjusted; NaCl concentration = 10% (m/v); extraction time = 2 minutes; centrifugation time = 5 minutes; speed = 2000 rpm.

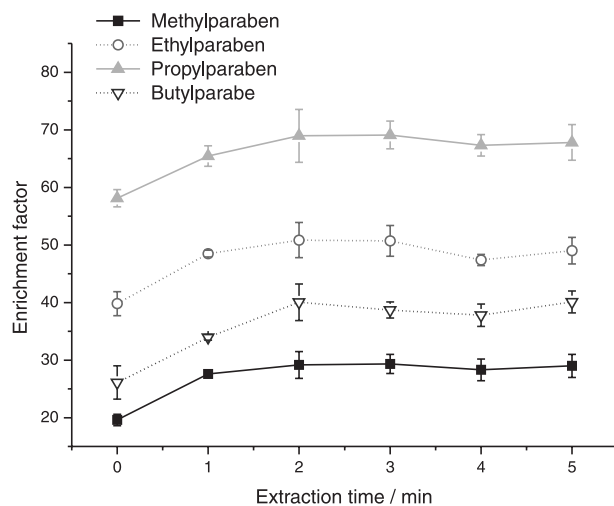


Figure S5. Effect of extraction time. Extraction condition: parabens concentration = $50 \mu\text{g L}^{-1}$; water sample volume = 10.0 mL; volume of 1-octanol = 0.1 mL; volume of acetone = 1.0 mL; pH = not adjusted; NaCl concentration = 10% (m/v); centrifugation time = 5 minutes; speed = 2000 rpm.

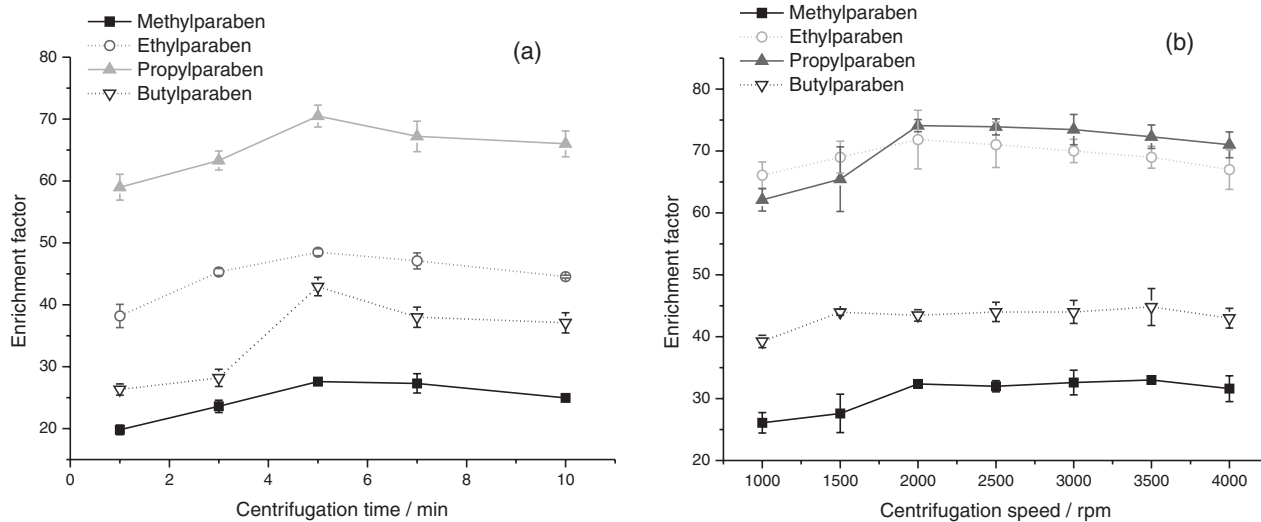


Figure S6. Effect of centrifugation (a) time; (b) speed. Extraction condition: parabens concentration = $50 \mu\text{g L}^{-1}$; water sample volume = 10.0 mL; volume of 1-octanol = 0.1 mL; volume of acetone = 1.0 mL; pH = not adjusted; NaCl concentration = 10% (m/v); extraction time = 2 minutes.

Table S1. Sampling locations in the Mogi Guaçu River, São Paulo state, Brazil

City (Site)	UTM Zone ^a / K	Latitude UTM / N	Longitude UTM / E
Guatapar (1)	22	806613.44	7619281.67
Rinco (2)	23	194174.01	7609550.37
Porto Ferreira (3)	23	242139.06	7582333.44
Porto Ferreira (4)	23	244179.49	7581944.94
Cachoeira de Emas (5)	23	254969.41	7573346.43
Cachoeira de Emas (6)	23	255323.87	7573472.21
Pirassununga (7)	23	262662.21	7564551.42
Martinho Prado (8)	23	280270.11	7532458.86
Mogi Guaçu (9)	23	297116.61	7525489.48
Mogi Guaçu (10)	23	298822.28	7524182.15
Mogi Guaçu (11)	23	299931.93	7524470.45
Mogi Guaçu (12)	23	300452.25	7524482.50
Mogi Guaçu (13)	23	301055.24	7524676.70
Itapira (14)	23	307042.05	7524337.52

^aUTM Zone = Universal Transverse Mercator Zone.

Table S2. Monitoring of parabens in river water

Site	MP ^a / ($\mu\text{g L}^{-1}$)	EP ^b / ($\mu\text{g L}^{-1}$)	PP ^c / ($\mu\text{g L}^{-1}$)	BP ^d / ($\mu\text{g L}^{-1}$)	Total parabens / ($\mu\text{g L}^{-1}$)	Reference
River water on Belgium	0.0851	0.0538	0.0784	–	–	6
Ria de Aveiro (Portugal)	0.0088-0.010	0.0004-0.0029	0.0015-0.0156	0.0002-0.0111	–	7
Glatt River (Switzerland)	0.005	0.0001	0.0006	0.0003	–	8
Taff River (South Wales, United Kingdom)	0.009-0.027	0.001-0.005	0.001-0.003	< 0.0003	–	10
Ely River (South Wales, United Kingdom)	0.011-0.068	0.001-0.004	0.004-0.007	0.003-0.006	–	10
Pearl River Delta (Guangzhou, China)	ND ^e -1.062	–	–	ND ^e -2.142	–	11
Allegheny and Monongahela Rivers (Greater Pittsburg Area, USA)	0.0022-0.0173	ND ^e	0.0092-0.012	ND ^e -0.0002	–	12
Colorado River (California, USA)	12.5-79.6 (dry season)	–	–	–	–	13
Colorado River (California, USA)	16.4-21.7 (wet season)	–	–	–	–	13
Kaveri River (India)	–	–	–	–	0.124	14
Tamiraparani River (India)	–	–	–	–	0.123	14
Vellar River (India)	–	–	–	–	0.0332	14
River water in Galicia (Northwest Spain)	ND ^e -0.037	ND ^e < 7.5	ND ^e < 6.3	ND ^e < 6.2	–	15
Mogi Guaçu River	8.0	5.8	13.1	15.1	–	this work

^aMethylparaben; ^bethylparaben; ^cpropylparaben; ^dbutylparaben; ^eND = not detected.