Supplementary Information

Development of aptasensor for dibutyl phthalate detection and the elucidation of assay inhibition factors

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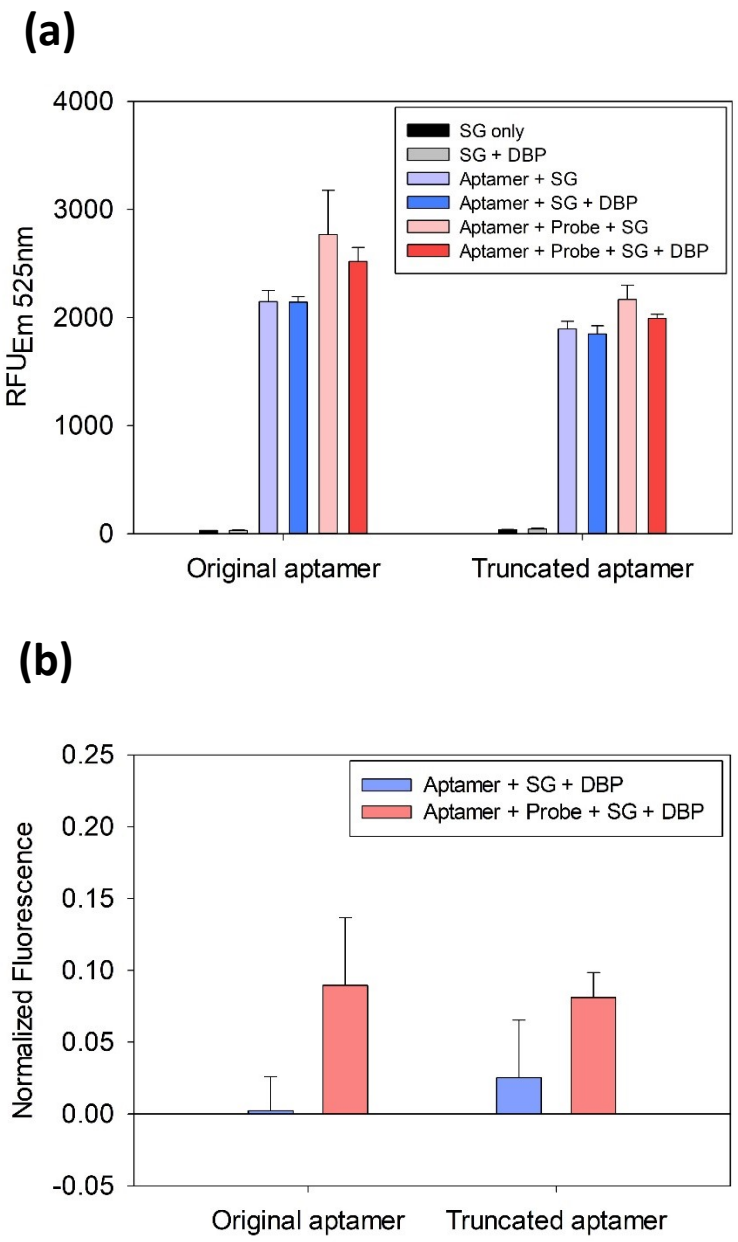

(a)
4000
3000
2000
1000
0
RFUEm 525nm
SG only
SG + DBP
Aptamer + SG
Aptamer + SG + DBP
Aptamer + Probe + SG
Aptamer + Probe + SG + DBP
Original aptamer
Truncated aptamer
(b)
0.25
0.20
0.15
0.10
0.05
0.00
-0.05
Normalized Fluorescence
Aptamer + SG + DBP
Aptamer + Probe + SG + DBP
Original aptamer
Truncated aptamer

Figure S1

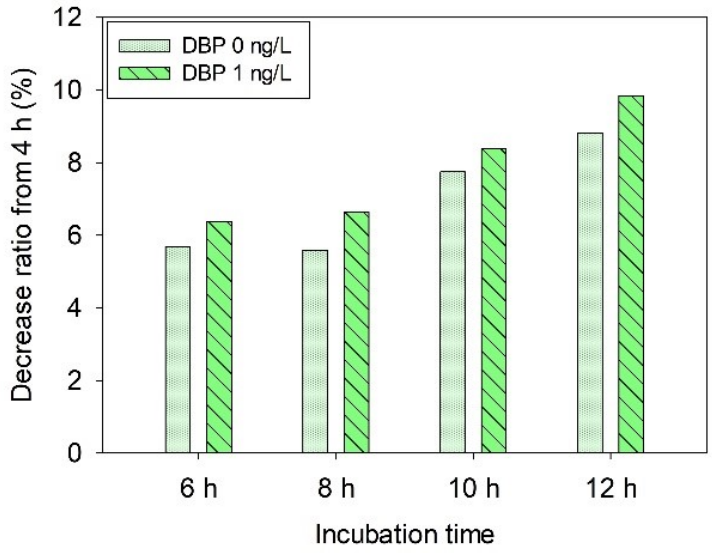

DBP 0 ng/L
DBP 1 ng/L
Decrease ratio from 4 h (%)
0
2
4
6
8
10
12
6 h
8 h
10 h
12 h
Incubation time

Figure S2

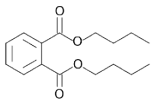
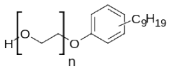
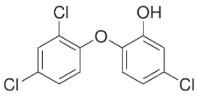
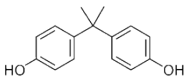
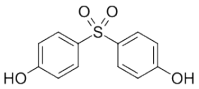
Name (Abbr.)	Molecular structure	Chemical formula	M.W	Solubility in water
Dibutyl phthalate (DBP)		$C_{16}H_{22}O_4$	278.348 g/mol	13 mg/L (20°C)
Nonylphenol ethoxylate (NPE)*		$C_{15}H_{24}O(C_2H_4O)n$	1,980 g/mol (70% in H_2O)	0.025 mg/L (25°C)
Triclosan (TCS)		$C_{12}H_7Cl_3O_2$	289.50 g/mol	10 mg/L (20°C)
Bisphenol A (BPA)		$C_{15}H_{16}Cl_2$	228.291 g/mol	120-300 mg/L (25°C)
Bisphenol S (BPS)		$C_{12}H_{10}O_4S$	250.27 g/mol	1100 mg/L (25°C)

Table S1. List of compounds that were used for the selectivity verification

*** Tergitol-type NP-40 (nonyl phenoxypolyethoxylethanol)**

Table S2. *P*-values (t-test) for selectivity of SG-aptasensor

Concentration	DBP	NPE	TCS	BPA	BPS
0 ng/L and 1 ng/L	**0.0058**	0.274	0.204	0.259	0.488

Table S3. *P*-values (t-test) for temperature experiment of SG-aptasensor

Temperature	2 ℃	13 ℃	25 ℃	37 ℃
2 ℃		0.116	0.229	**0.0005**
13 ℃	0.116		0.258	**0.008**
25 ℃	0.229	0.258		**0.00004**
37 ℃	**0.0005**	**0.008**	**0.00004**	

Table S4. Studies for the existence of PAEs in various environmental matrixes.

Matrix	Location	PAEs	Concentration (μg/L, ppb)	References
Water	Lake in Guangzhou city (China)	DBP DIBP DEHP	2.03 0.47 0.24	(Zeng et al. 2008)
	Manzanares and Jarama river (Spain)	DBP	0.82	(Domínguez-Morueco et al. 2014)
	Surface water in Northern industrial area (Sweden)	DBP DEP DMP BBP	6.8 0.63 0.40 0.17	(Bastos et al. 2012)
Soil or sediment	Agricultural paddy soils in Sanjiang Plain (China)	DEHP DBP DEP	0.22 0.16 0.06	(Wang et al. 2017)
Air	Urban home (Japan)	DBP DEHP DEP DCHP BBP	750 320 140 120 20	(Otake et al. 2004)
	California county (USA)	DEP DIBP DBP DEHP	45 44.5 31.5 3.65	(Lunderberg et al. 2019)

Table S5. List of precision (%RSD, Relative Standard Deviation)

Sensitivity (Figure 2B)

DBP concentration (ng/L)	Fluorescence intensity	Normalized fluorescence intensity
0	3.3	
0.1	1.9	60.3
0.5	0.5	11.1
1	0.6	7.4
5	1.0	10.8
10	2.4	22.3
50	0.7	6.4
100	5.1	26.5

Table S6. % inhibition for Figure 5

Ions	Fs Conc. (mM)	DBP 0 ng/L	DBP 1 ng/L
Mg^{2+}	0.01 mM	1.17%	-0.77%
	0.1 mM	1.31%	3.42%
	1 mM	-1.64%	2.94%
	10 mM	-4.07%	-0.88%
	100 mM	5.29%	13.43%
Ca^{2+}	0.01 mM	10.64%	10.07%
	0.1 mM	12.85%	5.22%
	1 mM	14.99%	12.06%
	10 mM	10.77%	9.02%
	100 mM	3.05%	2.45%
Cu^{2+}	0.01 mM	3.35%	4.26%
	0.1 mM	12.00%	9.80%
	1 mM	19.72%	20.96%
	10 mM	59.68%	62.84%
	100 mM	99.06%	98.82%

Note) % Inhibition = (Fc -Fs)/Fc *100, Fc = 0 mM

References

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(6) David M. Lunderberg*, Kasper Kristensen, Yingjun Liu, Pawel K. Misztal, Yilin Tian, Caleb Arata, Rebecca Wernis, Nathan Kreisberg, William W. Nazaroff, and Allen H. Goldstein. "Characterizing airborne phthalate concentrations and dynamics in a normally occupied residence." Environmental science & technology 53.13 (2019): 7337-7346.