Supporting Information

Detection of cyanobacteria in eutrophic water using a portable electrocoagulator and NanoGene assay

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Summary

- Number of pages: 9
- Number of figures: 4
- Number of tables: 4

1. Calibration curve: Cell density versus absorbance for laboratory samples

Using a counting chamber and 100 μL of laboratory sample, the number of *Microcystis aeruginosa* cells in one well was counted via light microscope. The number of wells and conversion factor (10) was multiplied to obtain the cell density (cells·mL^{-1}) in triplicates.
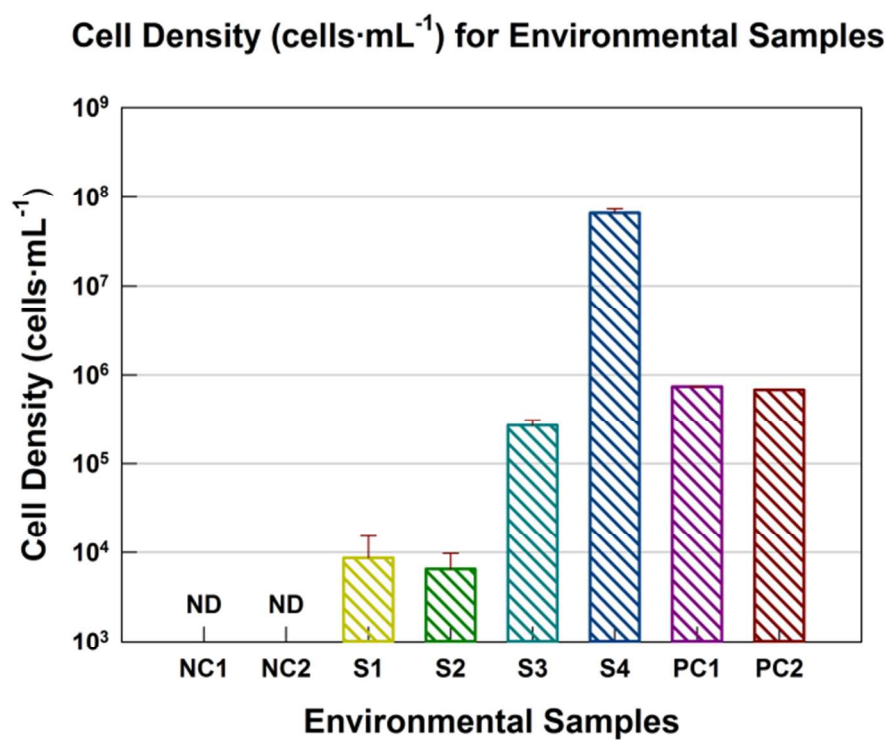
Cell density (cells·mL^{-1}) = cell numbers in 1 well × total numbers of well × 10 (conversion factor)

The laboratory sample's absorbance (optical density) at 680 nm was also obtained via SpectraMax M2 spectrofluorometer.
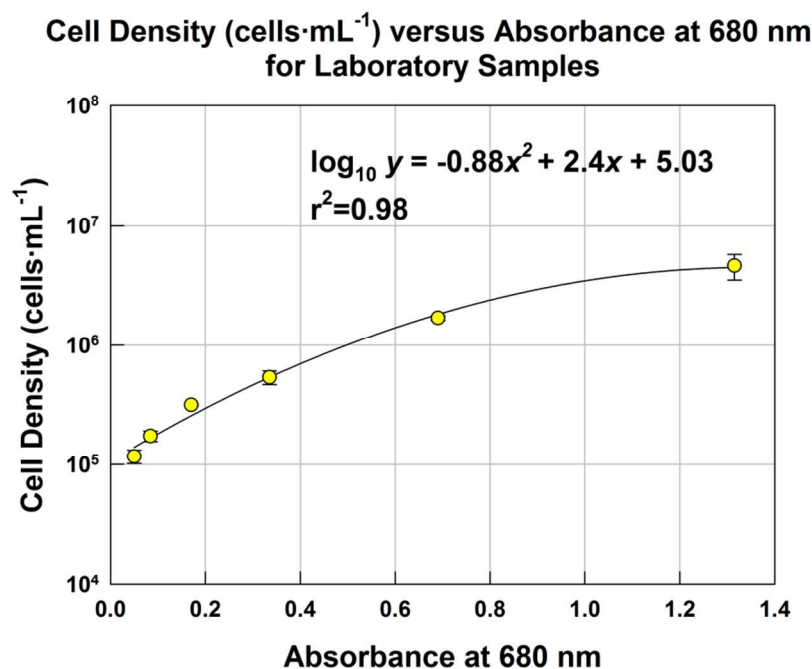
Figure S1. Cell density (cells·mL^{-1}) versus absorbance at 680 nm for laboratory samples.
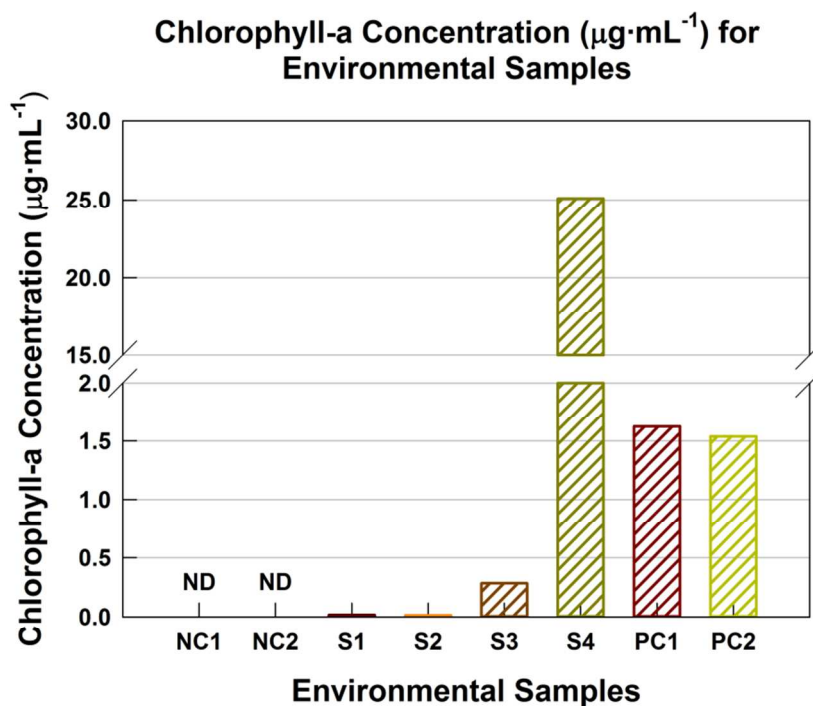
2a. Cell density for environmental samples.

Figure S2a. Cell density (cells·mL^{-1}) for environmental samples.
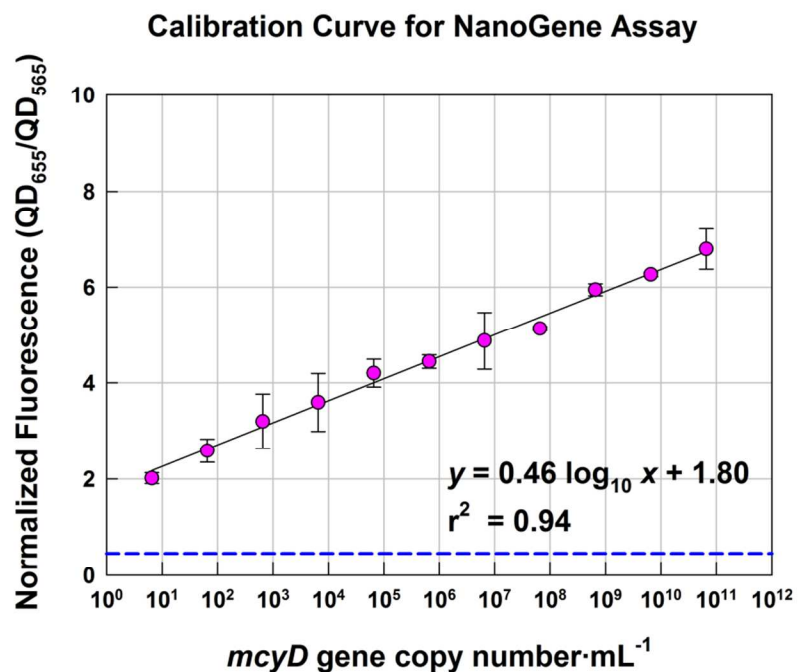
2b. Chlorophyll-a concentration for environmental samples

Ten mL of environmental sample was first filtered by a glass fiber filter. The filtered environmental sample was then transferred to 50 mL centrifugal tube and 10 mL of 90% purity acetone was added. Chlorophyll-a was extracted via sonication for 20 min. After centrifugation at 2400 rpm, the supernatant was subjected to absorbance measurement by a SpectraMax M2 spectrofluorometer at 664 nm and 750 nm. The chlorophyll-a concentration ($\mu g \cdot mL^{-1}$) was calculated based on prior reference[1]. The measurement was performed in duplicate.

Figure S2b. Chlorophyll-*a* concentration ($\mu g \cdot mL^{-}1$) for environmental samples.

3. Calibration curve for NanoGene assay

Calibration Curve for NanoGene Assay

$$y = 0.46 \log_{10} x + 1.80$$
$$r^2 = 0.94$$

X-axis: *mcyD* gene copy number·mL^{-1}

Y-axis: Normalized Fluorescence (QD$_{655}$/QD$_{565}$)

Figure S3. Calibration curve of NanoGene assay. Normalized fluorescence versus *mcyD* gene copy number. Dotted blue line represents the normalized fluorescence value of template (negative control) in absence of DNA for the NanoGene assay. Symbols and error bars indicate the mean and standard deviations of biological triplicates.

Table S1. Water quality data of environmental test samples.[1]

Sample	Location	Latitude/ Longitude	Water temperature (ºC)	pH	DO (mg/L)	BOD (mg/L)	COD (mg/L)	SS (mg/L)	T-N (mg/L)	T-P (mg/L)
NC1	Seocho, Seoul	37.47/ 127.03	29.2	7.9	7.9	1.5	5.0	6.8	5.02	0.317
NC2	Anyang, Gyeonngi province	37.39/ 126.97	28.4	7.6	4.5	3.8	7.7	5.6	7.73	0.040
S1	Gangdong, Seoul	37.54/ 127.11	28.2	7.9	8.3	2.0	4.7	5.5	2.37	0.036
S2	Seongdong, Seoul	37.53/ 127.03	29.1	8.1	6.7	0.8	3.6	3.4	2.44	0.031
S3	Yongsan, Seoul	37.52/ 126.96	29.6	7.4	4.2	1.5	4.3	6.8	3.45	0.084
S4	Yeongdeungpo, Seoul	37.55/ 126.89	30	7.7	5.1	1.4	5.4	11.6	3.19	0.103

1. DO represents dissolved oxygen; BOD indicates biochemical oxygen demand; COD represents chemical oxygen demand; SS refers to suspended solids; T-N represents total nitrogen; T-P indicates total phosphorus.

Table S2. Statistical analysis (t-test) between electrocoagulation and centrifugation with reference to Figure 4.

	Data	Statistical results
Figure 4a	Op duration (s)	*p*-value
	0	NA[a]
Pre-concentration efficiency (%)	30	0.000142
	60	0.0797
	90	0.139
	120	0.021
	180	0.342
	300	0.176
Figure 4b	Op duration (s)	*p*-value
	0	NA
Dry cell weight (g-DCW·L^{-1})	30	0.250
	60	0.152
	90	0.435
	120	0.374
	180	1.000
	300	1.000
Figure 4c	Cell density	*p*-value
	1.7×10^5	0.02780
Pre-concentration efficiency (%)	2.2×10^5	0.01610
	3.2×10^5	0.91300
	8.6×10^5	0.11200
	2.5×10^6	0.00019
	4.1×10^6	0.00207
Figure 4d	Cell density	*p*-value
	1.7×10^5	0.795
Dry cell weight (g-DCW·L^{-1})	2.2×10^5	0.435
	3.2×10^5	0.519
	8.6×10^5	0.422
	2.5×10^6	0.089
	4.1×10^6	0.400
Figure 4e	Cell density	*p*-value
	3.2×10^5	0.622
Normalized fluorescence	8.6×10^5	0.116
	2.5×10^6	0.400
Figure 4f	Cell density	*p*-value
	3.2×10^5	0.597
mcyD gene copy number·mL^{-1}	8.6×10^5	0.172
	2.5×10^6	0.380

[a] NA stands for not applicable.

Table S3. Statistical analysis (t-test) between electrocoagulation and centrifugation with reference to Figure 6.

	Data	Statistical results
Figure 6a & 6b	Sample	p-value
	NC1	NA[a]
Pre-concentration efficiency (%)	NC2	NA
	S1	NA
	S2	NA
	S3	0.0000402
	S4	0.248
	PC1	0.863
	PC2	0.700
Figure 6c & 6d	Sample	p-value
	NC1	NA
Dry cell weight $(g\text{-}DCW \cdot L^{-1})$	NC2	NA
	S1	NA
	S2	NA
	S3	0.000562
	S4	0.048
	PC1	0.270
	PC2	0.330

[a] NA stands for not applicable.

Table S4. Statistical analysis (t-test) of zeta potential before (raw sample) and after treatments of electrocoagulation and centrifugation with reference to Table 2.

	Data	Statistical results (p-value)	Statistical results (p-value)
Table 2	Sample	Electrocoagulation	Centrifugation
Zeta potential (mV)	NC1	NA[a]	NA
	NC2	NA	NA
	S1	NA	NA
	S2	NA	NA
	S3	0.008	0.333
	S4	0.146	0.117
	PC1	0.00029	0.00695
	PC2	0.00436	0.00144

[a] NA stands for not applicable.

References

1. Standard methods for examination of water and wastewater, 1998, 20th edition, American Public Health Association, Washington, D.C.
2. Water information system, Ministry of environment in Korea, http://water.nier.go.kr/ (accessed date March 2016)