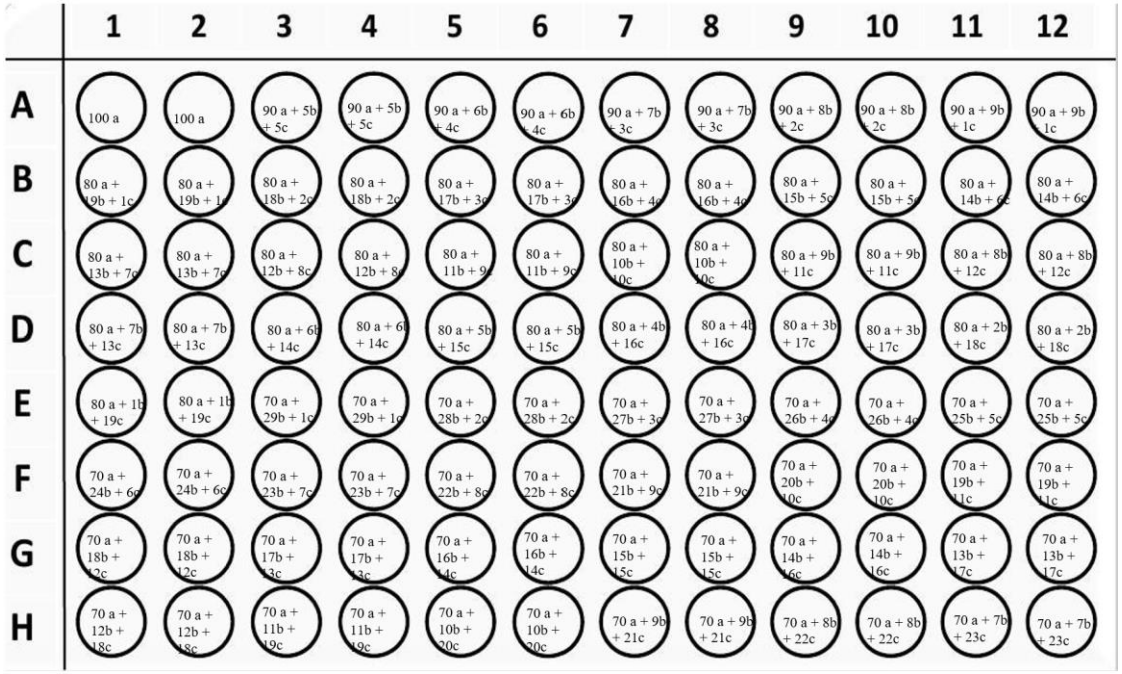
Article

Detecting redox potentials using porous boron nitride/ATP-DNA aptamer/methylene blue biosensor to monitor microbial activities

Kai Guo, Zirui Song , Gaoxing Wang and Chengchun Tang


1 2 3 4 5 6 7 8 9 10 11 12
A
100 a
100 a
90 a + 5b + 5c
90 a + 5b + 5c
90 a + 6b + 4c
90 a + 6b + 4c
90 a + 7b + 3c
90 a + 7b + 3c
90 a + 8b + 2c
90 a + 8b + 2c
90 a + 9b + 1c
90 a + 9b + 1c
B
80 a + 19b + 1c
80 a + 19b + 1c
80 a + 18b + 2c
80 a + 18b + 2c
80 a + 17b + 3c
80 a + 17b + 3c
80 a + 16b + 4c
80 a + 16b + 4c
80 a + 15b + 5c
80 a + 15b + 5c
80 a + 14b + 6c
80 a + 14b + 6c
C
80 a + 13b + 7c
80 a + 13b + 7c
80 a + 12b + 8c
80 a + 12b + 8c
80 a + 11b + 9c
80 a + 11b + 9c
80 a + 10b + 10c
80 a + 10b + 10c
80 a + 9b + 11c
80 a + 9b + 11c
80 a + 8b + 12c
80 a + 8b + 12c
D
80 a + 7b + 13c
80 a + 7b + 13c
80 a + 6b + 14c
80 a + 6b + 14c
80 a + 5b + 15c
80 a + 5b + 15c
80 a + 4b + 16c
80 a + 4b + 16c
80 a + 3b + 17c
80 a + 3b + 17c
80 a + 2b + 18c
80 a + 2b + 18c
E
80 a + 1b + 19c
80 a + 1b + 19c
70 a + 29b + 1c
70 a + 29b + 1c
70 a + 28b + 2c
70 a + 28b + 2c
70 a + 27b + 3c
70 a + 27b + 3c
70 a + 26b + 4c
70 a + 26b + 4c
70 a + 25b + 5c
70 a + 25b + 5c
F
70 a + 24b + 6c
70 a + 24b + 6c
70 a + 23b + 7c
70 a + 23b + 7c
70 a + 22b + 8c
70 a + 22b + 8c
70 a + 21b + 9c
70 a + 21b + 9c
70 a + 20b + 10c
70 a + 20b + 10c
70 a + 19b + 11c
70 a + 19b + 11c
G
70 a + 18b + 12c
70 a + 18b + 12c
70 a + 17b + 13c
70 a + 17b + 13c
70 a + 16b + 14c
70 a + 16b + 14c
70 a + 15b + 15c
70 a + 15b + 15c
70 a + 14b + 16c
70 a + 14b + 16c
70 a + 13b + 17c
70 a + 13b + 17c
H
70 a + 12b + 18c
70 a + 12b + 18c
70 a + 11b + 19c
70 a + 11b + 19c
70 a + 10b + 20c
70 a + 10b + 20c
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70 a + 7b + 23c
70 a + 7b + 23c

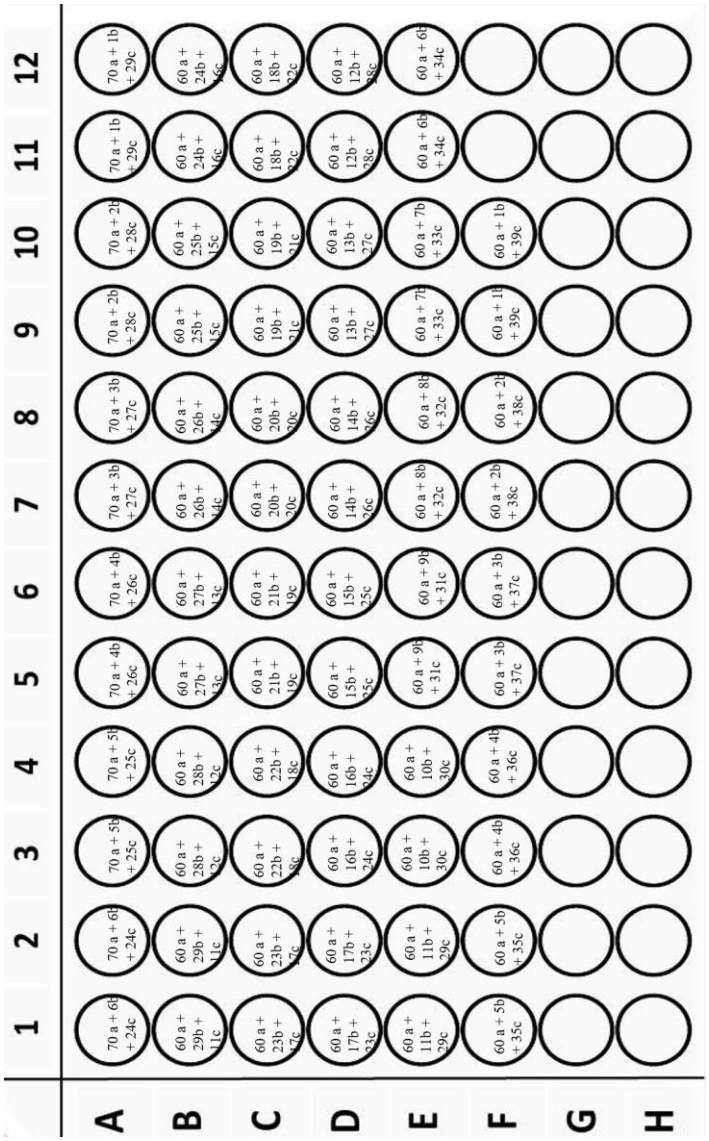

Figure S1. Fluorescence testing when changing the composition of microbial community (a: *Flavobacteria sp.*; b: *E coli.*; c: *Bacillus subtilis*).

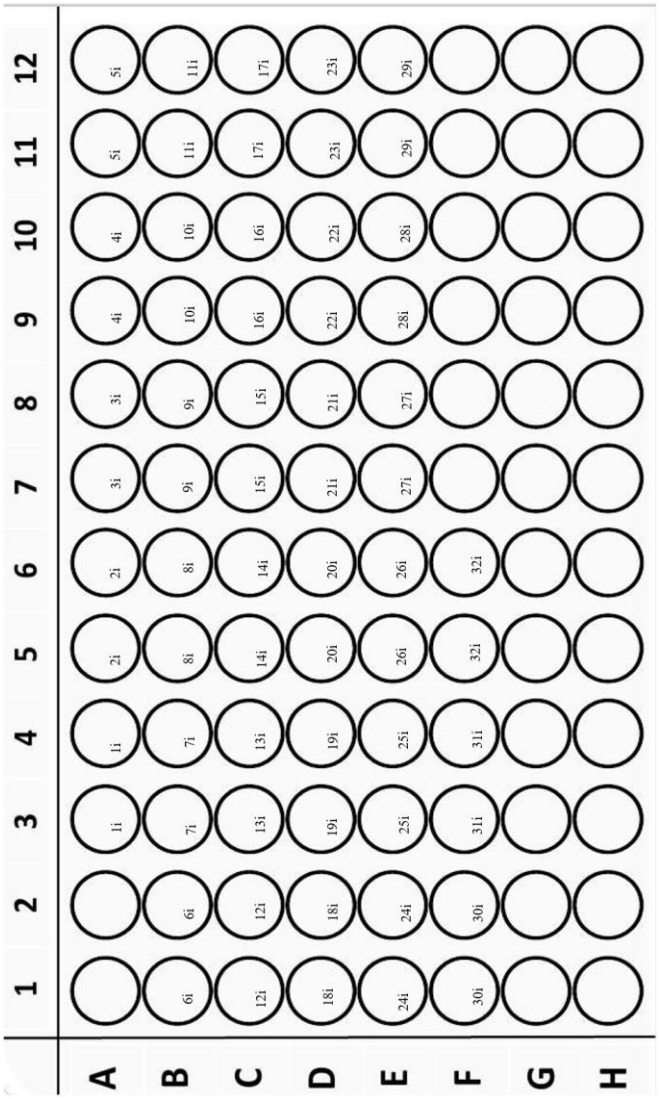

Figure S2. Added heavy metals to each well (Control A1 & A2). $Zn(CH_3COO)_2$ (i) is shown as an example here, according to which the other three metals are added as well.

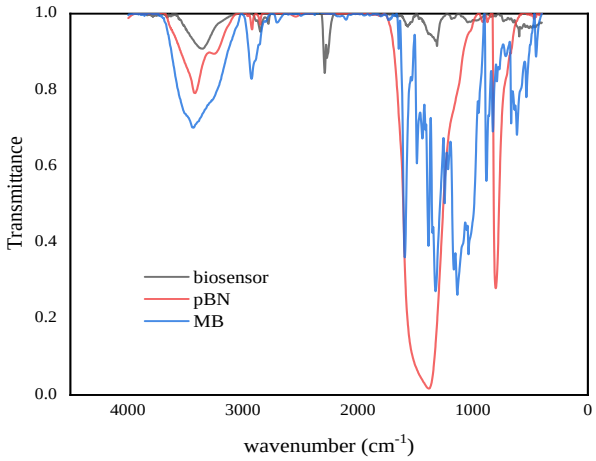

Figure S3. FTIR spectra of the biosensor, pBN and MB.

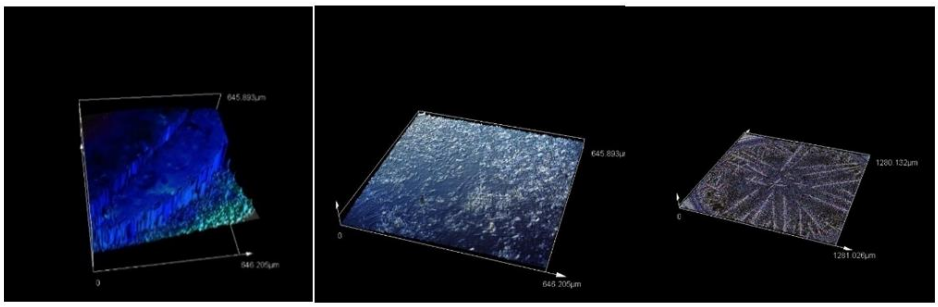

Figure S4. Images for biosensor (a), Flavobacterium sp. & biosensor (b), and Flavobacterium sp. & E coli. & Bacillus subtills (c) using laser bifocal microscope.

Figure S5. Colorimetric differences (a)MB; (b) MB-aptamer; (c) MB-aptamer-Fe (III); (d) MB-aptamer-ascorbic acid.

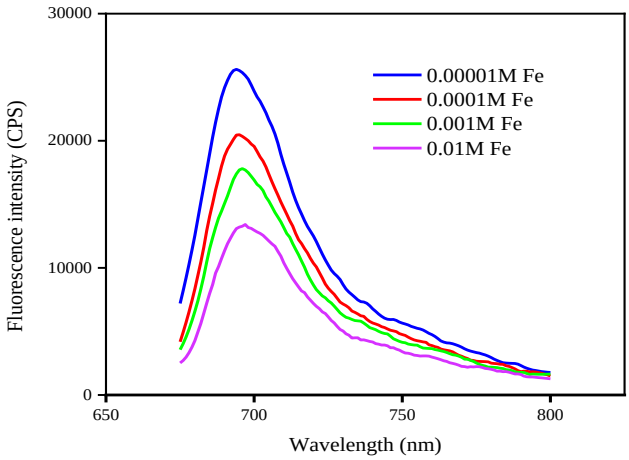

Figure S6. Fluorescence change when MB/biosensor was added to Fe (III) solution with different concentrations.

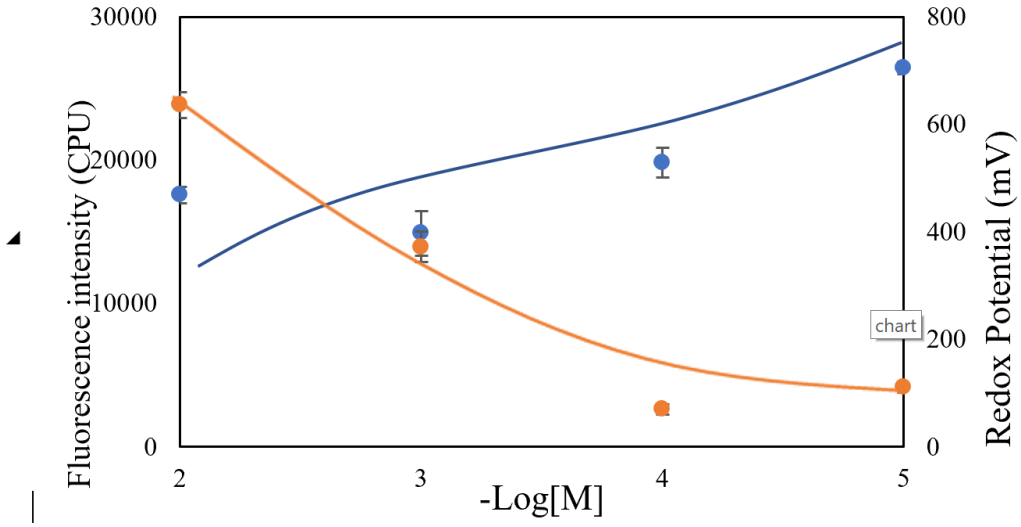

Figure S7. "Mirror" relationship between fluorescence intensity and redox potential as the concentration of Fe (III) inclined. .

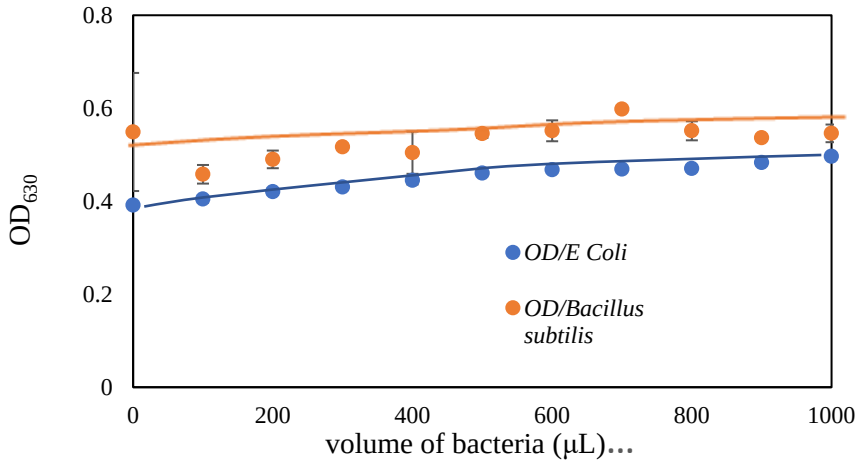

Figure S8. OD_{630} values after Flavobacteria sp. were grown with E coli. or Bacillus subtilis.

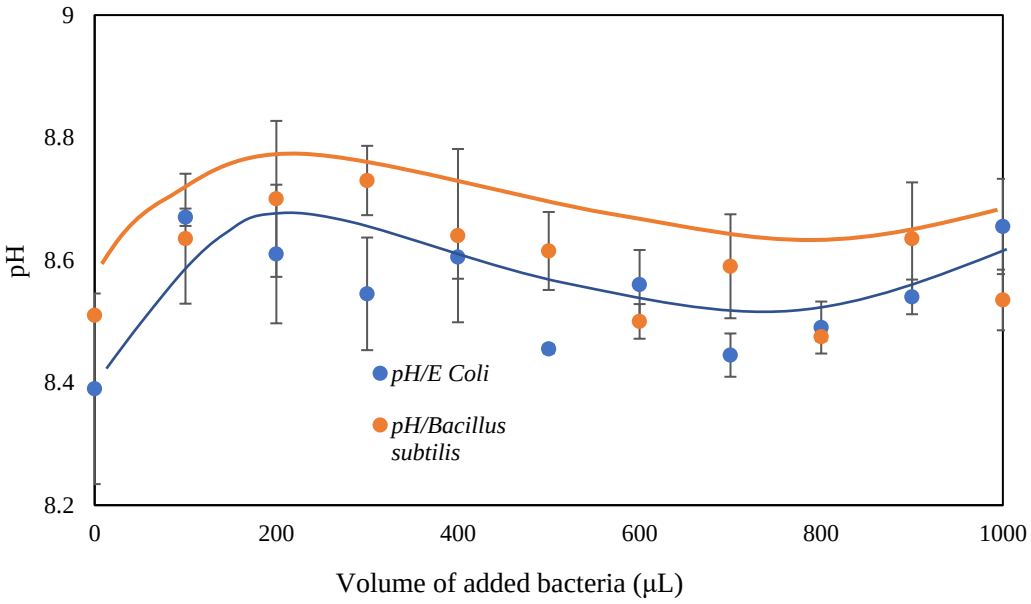

Figure S9. pH change after Flavobacteria sp. were grown with E coli. and Bacillus subtilis.