

1 *Supplementary Information*

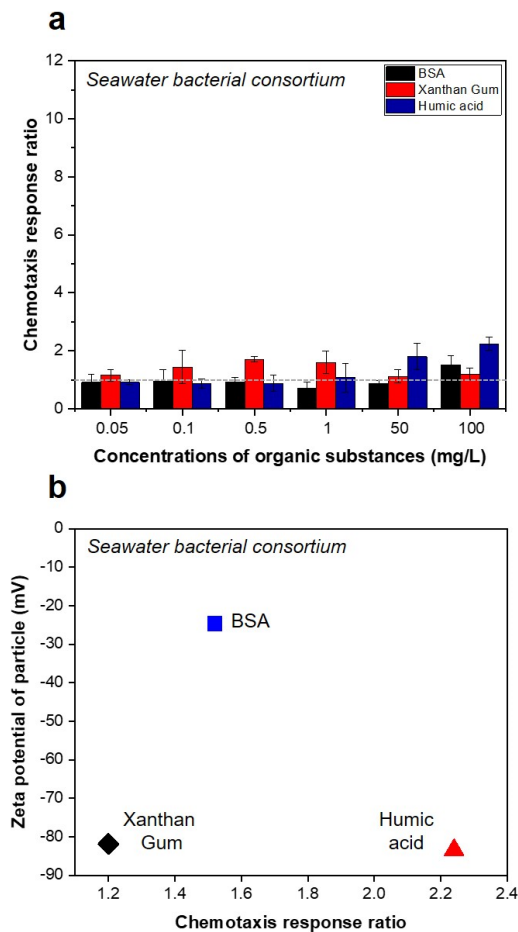
## 2 **Insignificant Impact of Chemotactic Responses of** 3 ***Pseudomonas aeruginosa* on the Bacterial Attachment to** 4 **Organic Pre-Conditioned RO Membranes**

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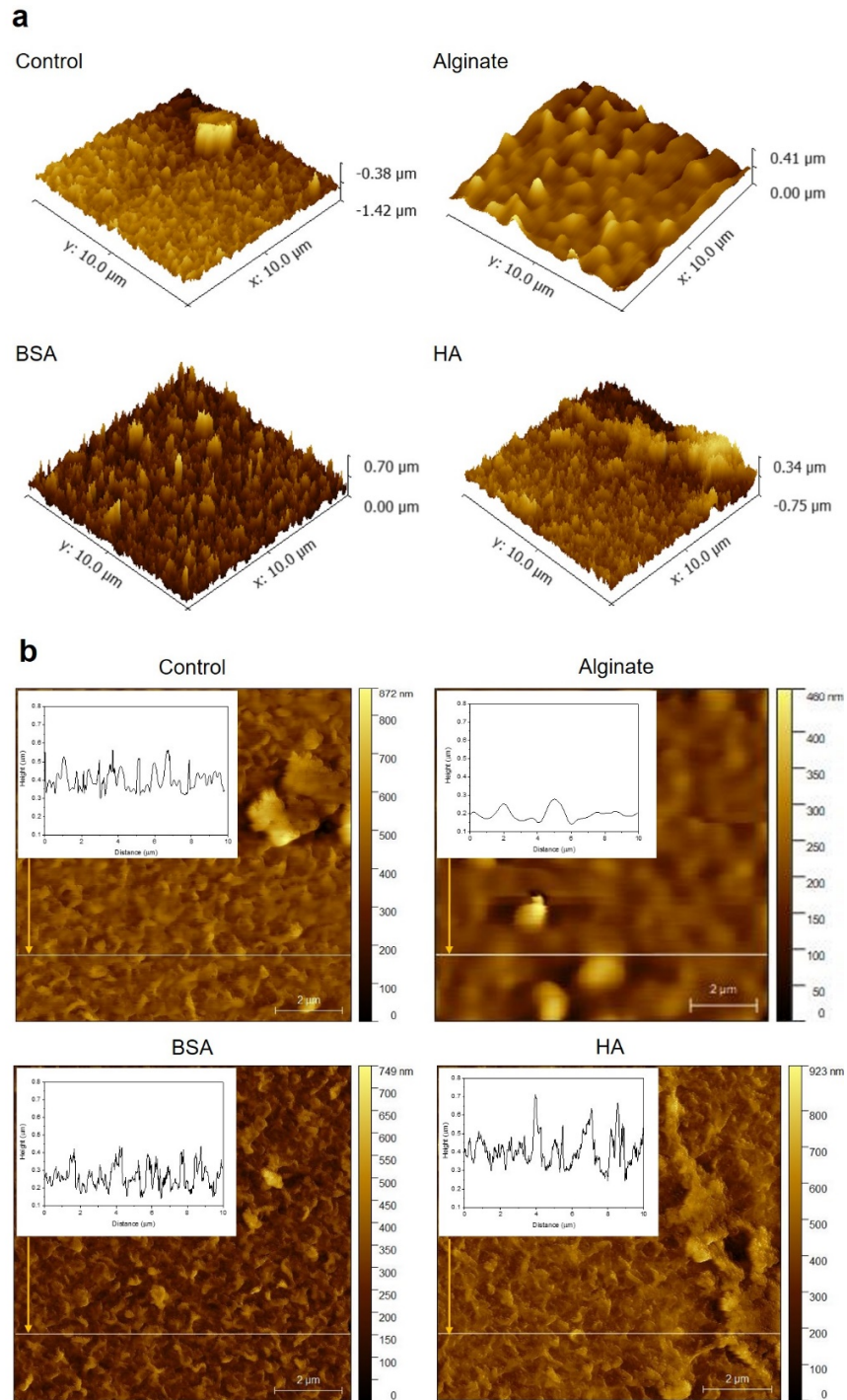
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13 **Figure S1. (a)** Chemotactic responses of seawater bacteria to the organic substances such as BSA, xanthan  
14 gum, and humic acid. The dotted line indicate the chemotaxis response ratio of "1". **(b)** Relations between  
15 surface charge of organic particles and chemotaxis response ratio.



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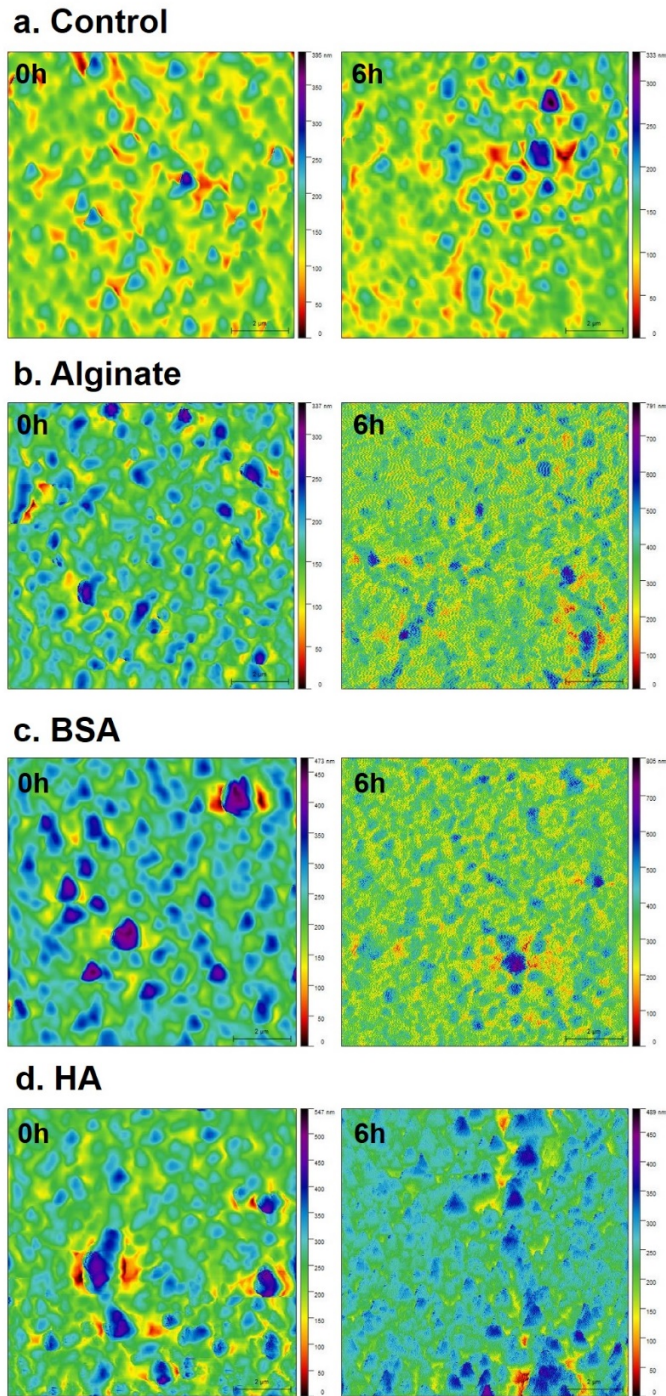
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**Figure S2.** (a) Three-dimensional AFM images of organic substance (control, alginate, BSA, HA) pre-conditioned RO membranes with scanned areas of  $10 \times 10 \mu\text{m}^2$ . (b) Height profiles along the lines (yellow line).



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22 **Figure S3.** AFM images of (a) control (virgin RO membrane) and pre-conditioned membranes by (b)  
 23 alginate, (c) BSA, and (d) HA at 0 h and 6 h incubation with *P. aeruginosa* PAO1. The significant spectral  
 24 color changes were shown in the organic substances pre-conditioned membranes compared to the control  
 25 after 6 h incubation.

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**Table S1.** Composition of M9 medium.

| Composition           | Volume (mL) |
|-----------------------|-------------|
| M9 salts <sup>a</sup> | 200         |
| 1 M MgSO <sub>4</sub> | 2           |
| 20% glucose           | 20          |
| 1 M CaCl <sub>2</sub> | 0.1         |
| Total                 | 1000        |

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M9 salts (g/L): 64, Na<sub>2</sub>HPO<sub>4</sub>·7H<sub>2</sub>O; 15, KH<sub>2</sub>PO<sub>4</sub>; 2.5, NaCl; 5.0, NH<sub>4</sub>Cl

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**Table S2.** Surface energy of organic pre-conditioned RO membranes

| Membrane<br>Coupon | Contact Angle ( $\theta$ ) |                      |                      | Surface Energy (mJ/m <sup>2</sup> ) |                      |                      |
|--------------------|----------------------------|----------------------|----------------------|-------------------------------------|----------------------|----------------------|
|                    | Water                      | Formamide            | Diiodomethane        | $\gamma_s^d$                        | $\gamma_s^p$         | $\gamma_s$           |
| Virgin RO          | 49.31 ( $\pm 3.25$ )       | 16.99 ( $\pm 1.79$ ) | 24.86 ( $\pm 3.13$ ) | 34.44 ( $\pm 0.74$ )                | 21.86 ( $\pm 0.50$ ) | 56.29 ( $\pm 1.25$ ) |
| Alginate           | 42.3 ( $\pm 4.06$ )        | 25.93 ( $\pm 7.30$ ) | 27.71 ( $\pm 2.47$ ) | 31.63 ( $\pm 0.58$ )                | 26.31 ( $\pm 0.59$ ) | 57.94 ( $\pm 1.18$ ) |
| BSA                | 96.86 ( $\pm 3.33$ )       | 69.57 ( $\pm 3.71$ ) | 44.46 ( $\pm 2.23$ ) | 33.74 ( $\pm 0.59$ )                | 3.13 ( $\pm 0.28$ )  | 36.87 ( $\pm 0.87$ ) |
| Humic acid         | 57.99 ( $\pm 2.76$ )       | 34.14 ( $\pm 3.29$ ) | 28.88 ( $\pm 2.18$ ) | 34.53 ( $\pm 0.53$ )                | 16.18 ( $\pm 0.34$ ) | 50.71 ( $\pm 0.87$ ) |

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 $\gamma_s^d$ , dispersion component;  $\gamma_s^p$ , polar component;  $\gamma_s$ ; surface free energy

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**Table S3.** Membrane roughness and skewness of biofilm formed-conditioned membranes

| Composition of<br>conditioning film | Incubation<br>time (h) | Membrane roughness<br>( $S_q$ , nm) |                         | Skewness<br>( $S_{sk}$ ) |                   |
|-------------------------------------|------------------------|-------------------------------------|-------------------------|--------------------------|-------------------|
|                                     |                        | Without<br>nutrient                 | With<br>nutrient        | Without<br>nutrient      | With<br>nutrient  |
| Control <sup>a</sup>                | 0                      | 72.9 ( $\pm 9.7$ )                  | 43.9 ( $\pm 5.4$ )      | 0.9 ( $\pm 0.6$ )        | 0.9 ( $\pm 0.1$ ) |
|                                     | 6                      | 69.7 ( $\pm 9.1$ )                  | 65.9 ( $\pm 20.6$ )     | 1.2 ( $\pm 0.6$ )        | 1.8 ( $\pm 1.5$ ) |
|                                     | 48                     | 72.8 ( $\pm 2.4$ )                  | 44.8 ( $\pm 7.7$ )      | 0.8 ( $\pm 0.1$ )        | 0.6 ( $\pm 0.4$ ) |
| Alginate                            | 0                      | 45.5 ( $\pm 15.0$ )                 | 60.1 ( $\pm 9.2$ )      | 1.4 ( $\pm 0.8$ )        | 1.7 ( $\pm 0.4$ ) |
|                                     | 6                      | 93.7 ( $\pm 6.1$ )                  | 81.2 ( $\pm 6.2$ )      | 0.8 ( $\pm 0.1$ )        | 0.5 ( $\pm 0.1$ ) |
|                                     | 48                     | 66.3 ( $\pm 4.5$ )                  | 55.8 ( $\pm 5.3$ )      | 0.7 ( $\pm 0.1$ )        | 1.0 ( $\pm 0.0$ ) |
| BSA                                 | 0                      | 64.0 ( $\pm 25.2$ )                 | 63.0 ( $\pm 0.4$ )      | 1.2 ( $\pm 0.2$ )        | 0.4 ( $\pm 0.3$ ) |
|                                     | 6                      | 95.1 ( $\pm 2.5$ )                  | 124.6 ( $\pm 6.5$ )     | 0.6 ( $\pm 0.1$ )        | 0.3 ( $\pm 0.0$ ) |
|                                     | 48                     | 106.2 ( $\pm 17.7$ )                | 124.8<br>( $\pm 31.3$ ) | 2.6 ( $\pm 0.6$ )        | 1.9 ( $\pm 0.8$ ) |
| Humic acid                          | 0                      | 73.4 ( $\pm 6.4$ )                  | 60.5 ( $\pm .3$ )       | 1.6 ( $\pm 0.6$ )        | 1.9 ( $\pm 1.1$ ) |
|                                     | 6                      | 100.6 ( $\pm 11.0$ )                | 97.2 ( $\pm 6.9$ )      | 1.0 ( $\pm 0.4$ )        | 1.5 ( $\pm 0.7$ ) |
|                                     | 48                     | 149.2 ( $\pm 12.9$ )                | 90.0 ( $\pm 13.2$ )     | -0.4 ( $\pm 0.0$ )       | 0.9 ( $\pm 0.6$ ) |

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<sup>a</sup>Without addition of organic substances