Chemotactic response to bicarbonate and its relationship with CO_2 fixation efficiency in *Chlamydomonas reinhardtii*

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Many aquatic photosynthetic organisms such as microalgae utilize carbon dioxide (CO_2) and bicarbonate (HCO_3^-) as carbon sources through CO_2 concentrating mechanism. In this point of view, we tried to verify the relationship between the extent of chemotactic response towards HCO_3^- and carbon dioxide fixation efficiency of microalgae. In this study, we observed the chemotactic behaviors of the wild-type and mutants of a motile microalga, *Chlamydomonas reinhardtii* CC125, in a microfluidic device. The results showed that the well-growing mutants had a tendency towards higher HCO_3^- concentration. In other words, the quantitative measurement of chemotactic responses of well-growing mutants showed higher values. In addition, the correlations between the chemotactic response and both the growth ($\triangle$ OD) and the photosynthetic efficiency (Y(II)) showed high linearities. In conclusion, the chemotactic response towards HCO_3^- and the CO_2 fixation efficiency of microalgae are closely related. This result implies that this strategy can be used for high-throughput screening to identify superior microalgal strains with high CO_2 fixation efficiency.