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# STRATEGY FOR CONSTRUCTION OF ARTIFICIAL CHROMOSOMES WITH NATIVE FUNCTIONAL SEQUENCES IN THE MARINE DIATOM PHAEODACTYLUM TRICORNUTUM

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## Abstract

Microalgae have attracted much attention as promising hosts for valuable chemicals from carbon dioxide due to their photosynthetic activity. Genetic engineering is a promising approach to enhance the productivity of the target molecules of interest. However, development of the molecular genetic engineering tools for microalgae is still limited. We have aimed to develop an artificial chromosome enabling large-scale genetic engineering by introducing many functional genes. To this end, recently, native autonomous replication sequences (ARSs) were screened from the genome sequence of the marine diatom *Phaeodactylum tricorutum*. (1) ChIP-Seq study revealed 69 promising candidates of ARSs recognized by origin recognition complexes (ORCs) in the *P. tricorutum* genome. The ARS candidates showed approximately neutral GC contents, and did not have conserved motifs. These features are different from those found in *Saccharomyces cerevisiae*, possessing high AT-rich ARSs containing highly conserved motifs. After we found the ARS candidates, artificial chromosome vectors were constructed with or without native centromeres (2) and the ARS candidates, and their function were investigated. This study provides a strategy to design the artificial chromosomes replicated in diatoms.

(1) Hyun-Sik Y., Yoneda K., Sugasawa T., Suzuki I., Maeda Y. *Genome-Wide Mapping of Autonomously Replicating Sequences in the Marine Diatom Phaeodactylum tricorutum*,

*Mar Biotechnol* (2025) **27**, 14, DOI: 10.1007/s10126-024-10390-0

(2) Diner R.E., Noddings C.M., Lian N.C. et al. *Diatom centromeres suggest a mechanism for nuclear DNA acquisition*, *PNAS* (2017) **114** (29) E6015-E6024

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