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A new inducible expression system in a transformed green alga, *Chlorella vulgaris*

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ABSTRACT. Genetic transformation is useful for basic research and applied biotechnology. However, genetic transformation of microalgae is usually quite difficult due to the technical limitations of existing methods. We cloned the promoter and terminator of the nitrate reductase gene from the microalga *Phaeodactylum tricornutum* and used them for optimization of a transformation system of the microalga *Chlorella vulgaris*. This species has been used for food production and is a promising candidate as a bioreactor for large-scale production of value-added proteins. A construct was made containing the *CAT* (chloramphenicol acetyltransferase) reporter gene driven by the nitrate reductase promoter. This construct was transferred into the *C. vulgaris* genome by electroporation. Expression of *CAT* in transgenic *Chlorella* conferred resistance to the antibiotic chloramphenicol and enabled growth in selective media. Overall efficiency for the transformation was estimated to be approximately 0.03%, which is relatively high compared with other available *Chlorella* transformation systems. Expression of *CAT* was induced in the presence of nitrate and inhibited in the presence of ammonium as

a sole nitrogen source. This study presented an inducible recombinant gene expression system, also providing more gene regulation elements with potential for biotechnological applications.

Key words: Nitrate reductase; Inducible promoter; Gene transfer; Electroporation; Microalga

