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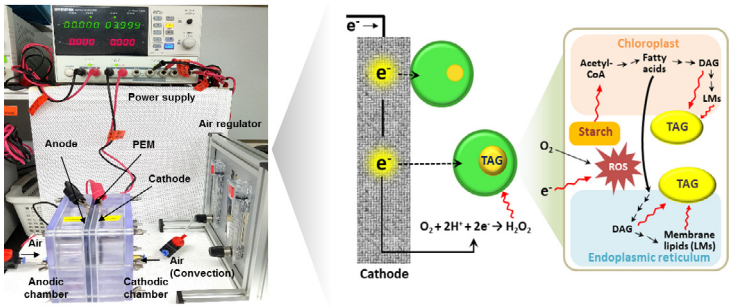
Rapid induction of edible lipids in *Chlorella* by mild electric stimulation

Sun-A Choi[a,b,1], Soo Youn Lee[a,1], Jiye Lee[a], Jun Muk Cho[c], Jin-Suk Lee[a], Seung Wook Kim[b,d], Dong-Yeon Kim[e], Se-Kook Park[f], Chang-Soo Jin[f], You-Kwan Oh[g,*]

[a] Gwangju Bio/Energy R&D Center, Korea Institute of Energy Research, Gwangju 61003, Republic of Korea
[b] Department of Chemical and Biological Engineering, Korea University, Seoul 02841, Republic of Korea
[c] Department of Chemical and Biomolecular Engineering, Korea Advanced Institute of Science and Technology, Daejeon 34141, Republic of Korea
[d] Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga, 60115, Indonesia
[e] CO_2 Energy Vector Research Group, Korea Research Institute of Chemical Technology, Daejeon 34114, Republic of Korea
[f] Energy ICT-ESS Laboratory, Korea Institute of Energy Research, Daejeon 34129, Republic of Korea
[g] School of Chemical & Biomolecular Engineering, Pusan National University, Busan 46241, Republic of Korea

GRAPHICAL ABSTRACT



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ABSTRACT

In this work, a new stress-based method for rapid induction of triacylglycerol (TAG) and total and polyunsaturated fatty acid accumulations in *Chlorella* sp. by mild electric stimulation is presented. When a cathodic current of 31 mA (voltage: 4 V) was applied to the algal cells for 4 h, the TAG content of the electro-treated cells was sharply increased to a level 2.1 times that of the untreated control. The contents of the polyunsaturated linoleic (C18:2n6) and linolenic (C18:3n3) acids in the electro-treated cells were also 36 and 57% higher than those in the untreated cells, respectively. Cyclic voltammetry and various biochemical analyses indicate that TAG and fatty acid formations are electro-stimulated via *de novo* fatty acid biosynthesis and metabolic transformation in the *Chlorella* cells.

1. Introduction

The supply of high-quality food will be an ever more important global issue in terms of affordability and sustainability (Klok et al., 2014). Over the past 10 years, microalgae have attracted great interest as a microscopic green biofactory for the sustainable production of transportation fuels, feed, and chemicals (Chew et al., 2018; Choi et al., 2017). Like edible plants, microalgal biomass is a rich source of lipids, carbohydrates, proteins, and a variety of antioxidants such as vitamins and carotenoid pigments. Notably, microalgae offer higher areal

* Corresponding author.
E-mail address: youkwan@pusan.ac.kr (Y.-K. Oh).
[1] These authors contributed equally to the work.

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