

Molecular and physiological studies on acutely induced disorders in a wide range of algae caused by co-incubation with acrylic resin nanoparticles

Project Leader

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1. Objective

This project is aimed at:

The most important characteristic of non-metallic nanoparticles is the huge surface area which is given even by the limited weight. We found algal cells suffer from strong stresses accompanying the generation of reactive oxygen species, when they are co-incubated with media containing nanoparticles. The stress often induces acute cell mortality in a wide range of algal species. In this project, we will focus on what kind of stresses nanoparticles can exert on algal cells by co-incubation with nanoparticles in media. We will analyze the resulting changes in gene expression and physiology, and we will establish a general model of how nanoparticles induce cell mortality. The main organism used in this project will be the unicellular green alga, *Chlamydomonas reinhardtii*.

2. Project Outline

To that end, the project will consist of the following phases:

- (a) Identification of the primary determinant for inducing cell mortality by nanoparticle co-incubation
- (b) Identification of the changes in gene expression by nanoparticle co-incubation
- (c) Development of a system to produce specific metabolites in algal cells
by artificially inducing stress by nanoparticles

3. Expected Performance

In this project, the successful candidate would be expected to:

- (a) Culture and assay of nanoparticles sensitivity on various algal species
- (b) Perform real-time analysis of changes in gene expression
based on PCR analysis or RNA sequence analysis
- (c) Development of a plant cell factory to produce metabolites utilizing stress caused by nanoparticles

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

- (a) Basic knowledge for molecular biology
- (b) Basic knowledge for bioinformatics
- (c) Basic knowledge for cell biology

References

Rico, C. M., Majumdar, S., Duarte-Gardea, M., Peralta-Videa, J. R., & Gardea-Torresdey, J. L. (2011). Interaction of nanoparticles with edible plants and their possible implication in the food chain. *Journal of Agricultural and Food Chemistry*, 59(8), 3485-3498.

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