Genetic Engineering-2013
International Conference on
Genetic Engineering & Genetically Modified Organisms
August 12-14, 2013 Raleigh-North Carolina, USA

The application of optical tweezers and excimer laser surgery to direct gene transfer in plant cells

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Abstract

Gene transfer or gene transformation is an important method in genetic engineering for treatment of rare genetic disorders or diseases. Several principle techniques of direct gene transfer, which are proven effective, are protoplast fusion, microinjection, electroporation, liposome mediated DNA delivery, micro-projection gun, and co-cultivation technique. However, each technique is suitable to certain specific cell, not all kinds of cell. For our targeted plant cells, these techniques hardly show promising result of gene transfer due to thick cell walls. To overcome this difficulty, we present the application of optical tweezers and excimer laser surgery for the gene transfer in plant cells. Optical tweezers are generally used for micro-particle trapping under the microscope following the momentum conservation law and an excimer laser is used for microsurgery at the specific site of biological samples without thermal damage. In the experiment, the two month cultured cells were punctured through their cell walls by excimer lasers. Then gene vector (liposome mediated targeting gene) were trapped and moved into the cell through the puncture cell walls by optical tweezers. The liposome was fused and targeting gene flowed into cytoplasm. We observed transient and stable gene expression. The experiment shows promise of it's application in direct gene transfer into specific targeting cell which will benefit for specific gene targeting in gene therapy in the future.

Biography

Titirat Kantawang completed her bachelor's degree in Science, Biotechnology, from Mae Fah Luang University. She is a graduate student from Interdisciplinary program in Genetic Engineering at Kasetsart University, Bang Khen Campus, Thailand. This work was supported by the scholarships from National Research University Fund (NRU), The National Nanotechnology Center (NANOTEC) and Kasetsart University Research and Development Institute (KURDI).