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 required for treatment of rare genetic disorders. There exist several techniques of direct gene transfer which are proven to be effective such as protoplast fusion, microinjection, electroporation, liposome mediated DNA delivery, micro-projection gun, and *Agrobacterium* co-cultivation technique. However, each technique is quite specific to certain organisms and not universally applicable to all cell types. For our targeted plant cells, presence of cell wall hinders the success of gene transfer. To overcome this physiological limitation, our laboratory has applied excimer laser surgery along with optical tweezers to transfer DNA into plant cells. In our attempt, *Selaginella erythropus* cells were ablated with an excimer laser to partially remove cell wall. Then optical tweezers were used to trap liposome containing bromophenol blue and bring it adjacent to the laser exposed cell membrane in an order to fuse and release its content inside the plant cell. Next liposome containing plasmid with Green Fluorescent Protein gene will be investigated in similar fashion. This experiment will prove laser technology and optical tweezers crucial instruments for genetic engineering of all living organisms.
This work was supported by Kasetsart University Research and Development Institute (KURDI), The National Nanotechnology Center (NANOTEC) and National Research University Fund (NRU).

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).