Genetic Engineering-2013

International Conference on
Genetic Engineering & Genetically Modified Organisms

August 12-14, 2013 Raleigh-North Carolina, USA

Optimizing cell membrane permeabilization through shock waves: Towards novel approaches for anti-cancer gene therapy

Blanca E. Millan-Chiu
Universidad Nacional Autonoma de Mexico, Mexico

Abstract

Background: Physical methods to permeabilize cell membranes have been proposed for gene transfer-mediated anti-cancer therapies. Due to their extracorporeal application and focusing, shock waves could be used for minimally invasive therapies. However, the efficacy of cell transfection mediated by shock waves needs further improvement. The phenomenon responsible of shock wave-mediated permeabilization is acoustic cavitation, which may be enhanced using tandem shock waves.

Objective: The aim of this study is to investigate single-pulse and tandem shock waves for cell survival, cell membrane permeation and transfection in the human breast adenocarcinoma cell line MCF-7.
Methods: Tandem shock waves were generated using a customized piezoelectric device. Cell survival was monitored through the colorimetric MTT assay. Membrane permeabilizing shock waves were established by monitoring the entry of fluorescent dyes, using confocal microscopy and fluorescence-assisted cell sorting analyses. The green fluorescent protein-codifying plasmid *pCX::GFPGPI2* was used as a reporter in cell transfection experiments.
Results: Tandem shock waves proved to be less toxic to cells and induced higher transient permeability in cell membranes when the delay between the two positive peak pressures was between 300 and 600 μs. Using tandem shock waves, MCF-7 cells presented survival rates from 75 to 90% and led a macromolecular dye to be internalized in a dose-dependent way. The usefulness of these parameters for cell transfection is being investigated.

Conclusion: Our data showed that, compared to single-pulse shock waves, tandem shock waves induce higher cell membrane permeability in human breast adenocarcinoma derived cells, with minimal mortality.

Biography

Blanca Millan-Chiu received her Ph.D. in Biological Sciences from the National University of Mexico (UNAM) in 2011. Her work has addressed molecular bases of diseases. She is currently under a postdoctoral research training at the Center of Applied Physics and Advanced Technology, National University of Mexico, where she explores the use of shock waves for gene transfer purposes. She has published 5 papers in reputed journals.