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Lipoplexes and shock waves: a promising strategy for gene therapy

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Abstract

Background: Non-viral gene therapy has a great potential for the treatment of diseases. Both chemical and physical strategies of gene transfer have being explored; however, there is an urgent need to improve their efficacy.
Objective: The aim of this study is to investigate a combination of DNA/cationic lipid nano-assembly and shock wave-mediated acoustic cavitation for *in vitro* transfection of human cells.
Methods: Cell membrane permeabilizing shock waves were established by monitoring the entry of fluorescent dyes, using confocal microscopy and fluorescence-assisted cell sorting analyses. Cell transfection experiments were performed in HEK 293 cells by employing a green fluorescent protein-codifying plasmid, either naked or complexed with cationic lipids.

Results: Cells were permeabilized and transfected after 1 to 3 min treatments with 60 to 180 shock waves using peak positive pressure amplitudes of 12.3 ± 1.5 MPa. The use of DNA/cationic lipid assemblies increased exogenous protein expression 3.8- and 3.1-fold, compared to cells transfected only by shock waves or cationic lipids, respectively.
Conclusion: Our data showed that a combination of cationic DNA nano-assemblies and shock waves promote high levels of foreign gene expression in human cells, thus encouraging the study of this approach for gene therapy applications.

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 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.