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Original Article

Genomic signature and toxicogenomics comparison of polycationic gene delivery nanosystems in human alveolar epithelial A549 cells

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Abstract:

Background and the purpose of the study: Of the gene delivery systems, non-viral polycationic gene delivery nanosystems have been alternatively exploited as a relatively safe delivery reagents compared to viral vectors. However, little is known about the genomic impacts of these delivery systems in target cells/tissues. In this study, the toxicogenomics and genotoxicity potential of some selected polycationic lipid/polymer based nanostructures (i.e., Oligofectamine® (OF), starburst polyamidoamine Polyfect® (PF) and diaminobutane (DAB) dendrimers) were investigated in human alveolar epithelial A549 cells.

Methods: To study the nature and the ontology of the gene expression changes in A549 cells upon treatment with polycationic nanostructures, MTT assay and microarray gene expression profiling methodology were employed. For microarray analysis, cyanine (Cy3/Cy5) labeled cDNA samples from treated and untreated cells were hybridized on target arrays housing 200 genes.

Results and major conclusions: The polycationic nanosystems induced significant gene expression changes belonging to different genomic ontologies such as cell defence and apoptosis pathways. These data suggest that polycationic nanosystems can elicit multiple gene expression changes in A549 cells upon their chemical structures and interactions with cellular/subcellular components. Such impacts may interfere with the main goals of the desired genemedicine.

Keywords:

Gene Delivery Nanosystem ، Gene Expression ، Genocompatibility ، Microarray ، Toxicogenomics

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