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High Efficiency Transfection of Cells with Nucleic Acid Constructs, Proteins and Small Molecules

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Inventors

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Invention Description

Genetic intervention techniques, such as gene silencing and gene expression, are important in many facets of healthcare and research. However, a major challenge in the above applications is the efficient transfection of primary cells lines such as neurons. Non-viral transfection methods are widely used in both *in vitro* and *in vivo* systems; however, these methods are less effective in neuronal cells. Improved transfection strategies that are consistent, highly efficient, and which preserve cell viability would be a boon to many fields of medicine and research.

Researchers at Arizona State University have developed novel methods using nanostructures and voltage-controlled chemical transfection for scalable, targeted delivery of nucleic acid constructs, proteins, and drug molecules into desired cells or neurons *in vitro*. These strategies have high efficiency rates, very low impacts on cell viability, are minimally affected by cell density, and allow a graded level of gene expression inhibition. Moreover, these methods allow for simultaneous transfection and assessment of phenotypical responses at cellular and network levels, in real time and in a high-throughput (HTP) fashion.

These novel transfection strategies increase the possibilities for difficult-to-transfect cells and allow for greater control and real-time assessment of gene expression modulation.

Potential Applications

- Efficient and consistent transfection of difficult-to-transfect cells
  - Tunable gene expression
  - Gene therapy in neurodegenerative disease and cancer
  - Target identification and validation in drug discovery
- Development of HTP screening systems for large libraries of siRNA molecules
- Development of HTP living cell assays
- Gene therapeutic assessment

Intellectual Property Status:

Patent Pending

Benefits and Advantages

- Rapid, consistent and repeatable process
  - The entire protocol takes less than 10 minutes
- Can be scaled to easily realize HTP living cell arrays
- Simultaneous transfection and assessment of cells
- Allows for spatial targeting of cells so that multiple molecular candidates can be simultaneously assessed on the same platform
- Cell viability is virtually unaffected
- Approximately 4-times increase in cell loading of siRNA

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