Tailored transfection reagents for modification of neural cells

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About RJH Biosciences

We develop novel transfection reagents that deliver different types of nucleic acids to a range of mammalian cells in culture, while tailoring the transfection agents further to act as delivery vehicles for preclinical models and clinical therapy involving nucleic acids. Our reagents display exceptional activities on specific types of cells, while acting broadly for delivery of different types of nucleic acids.

Transfection Reagents

We offer specific and broadly acting transfection reagents to modify cells with DNA and RNA. The reagents are polymeric in nature and have been optimized for a variety of cell types and applications involving cell culture (*in vitro*) and animal models (*in vivo*). We offer reagents tailored for primary and suspension cells, as well as adherent cell lines.

Clinical Development

We are developing delivery systems to implement nucleic acid therapeutics in a clinical setting. Our goals are to realize the therapeutic potential of nucleic acid involved in RNAi (siRNA) and transgene expression (pDNA and mRNA). Partnerships are actively sought for various preclinical and clinical programs.

R&D Services

We offer high quality research and development services associated with transfection optimization and construct validation. Our goal is to provide the best delivery materials for your cargo and cell of choice. Our services are assessed and initiated by a quote request via the screening services page on our website or by a simple email.

Genetic Modification of Neuronal Cell Models

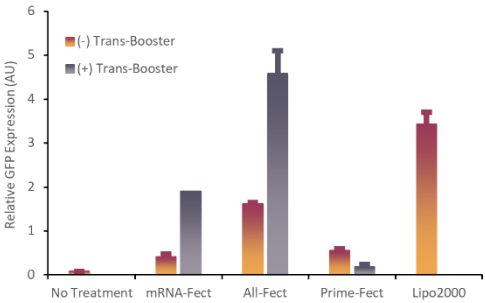
Genetic alterations in neuronal cells cause a multitude of neuronal abnormalities. New treatment options based on precision medicine are widely explored for modification of neuronal cells with a range of nucleic acids. It is possible to force-express desired proteins in cells while modulating signaling networks or silencing specific proteins using RNAi. For an effective intervention, transfection reagents capable of delivering nucleic acid payloads across neuronal cells are needed. RJH Biosciences has developed a range of transfection reagents capable of delivering various nucleic acids to neuronal cells.

Neuro 2A Cells and Dorsal Root Ganglion (DRG) Cells as Models of Neurons

Neuro2a (N2a) cells are a commonly used model of neurons. They are crest-derived mouse neuroblastoma cells, characterized by their ameboid stem cell morphology and fast growth. N2a cells are used to study mechanisms behind neuronal differentiation, axonal growth, neurodegeneration and more. On the other hand, DRG cells are primary neurons whose main function is to transmit sensory signals to the dorsal side of the spinal cord. DRG cells express common mature neuronal markers such as Neurofilaments, UCHL1 and class III β-tubulin. Due to their capability to grow dendrites and axons *in vitro*, and express ion channels, DRG cells are employed in pain research and electrophysiology studies.

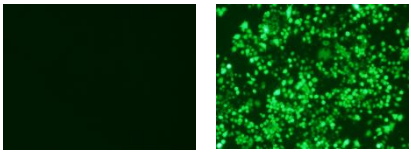
mRNA Transfection

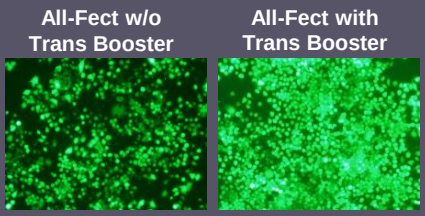
Messenger RNA (mRNA) can be readily processed in cytoplasm to quickly yield a large quantity of proteins, making mRNA delivery convenient for scientific purposes. RJH Biosciences has developed a variety of transfection reagents capable of high efficiency mRNA delivery.



Transfecting Neuro 2A cells with a GFP-expressing mRNA using a variety of RJH reagents. GFP expression was evaluated using spectroscopy. High transfection efficiencies were achieved using the RJH reagent All-Fect.

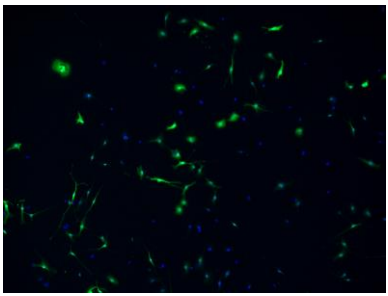
Transfecting Neuro 2A cells with a GFP-expressing mRNA using All-Fect. High efficiency mRNA delivery was achieved, as visualized by fluorescent microscopy.





Neuro 2A cells transfected with a GFP-expressing mRNA using All-Fect with and without Trans-Booster. The Trans-Booster enhances transfection efficiencies with mRNA in N2a cells.

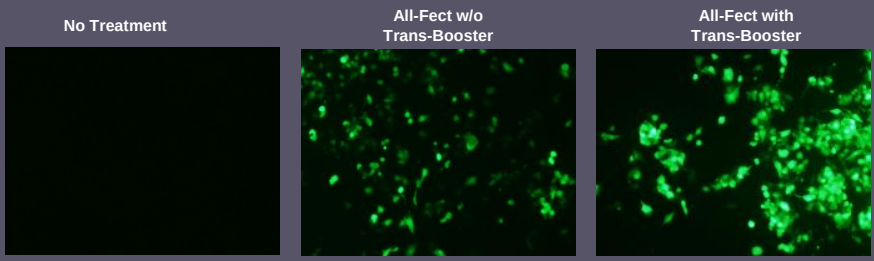
Transfection of primary rat dorsal root ganglion (DRGs) neurons with a GFP mRNA using All-Fect. DAPI stained GFP-expressing neurons indicate a high efficiency transfection from the GFP-mRNA in primary neurons.

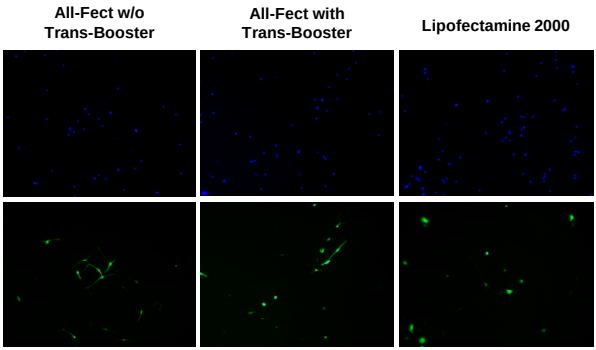


pDNA Transfection

Plasmid DNA (pDNA) is a circular nucleic acid that can self-replicate and be designed to express desired proteins. Being a large hydrophilic molecule, pDNA cannot cross cell membranes, so that RJH Biosciences has designed reagents that can effectively transport pDNA into cells. Several of these reagents have shown high efficacy in neural cell lines.

Using All-Fect with and without Trans-Booster to transport GFP-expressing pDNA into N2a cells. High GFP expression were observed in transfected N2a cells, with Trans-Booster increasing GFP expression efficiencies.



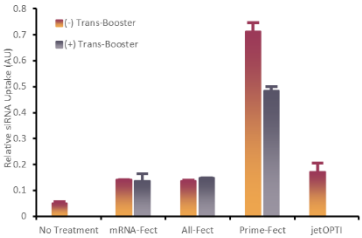


Transfection of primary Dorsal Root Ganglion (DRGs) neurons using All-Fect with and without Trans-Booster. The fluorescent microscopy images show efficient pDNA expression in primary neurons (GFP expression in bottom images; corresponding DAPI staining at the top).

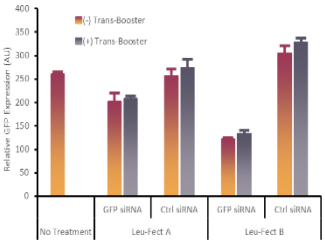
siRNA Transfection

Small interfering RNAs (siRNAs) are short double-stranded RNA molecules that enable knockdown of desirable proteins by degrading the corresponding mRNAs to prevent translation. Effective delivery of siRNA complexes using RJH reagents has been achieved with neural cell lines.

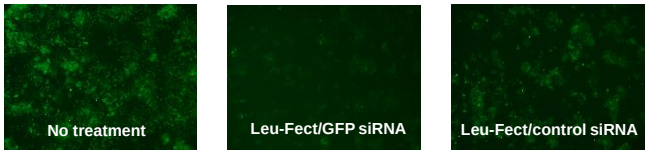
Delivery of FAM-labeled siRNA to Neuro 2a cells using various RJH reagents. Prime-Fect provided higher transfection efficiencies than a leading commercial reagent.



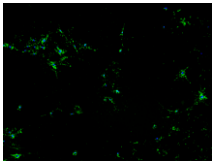
FAM-labeled siRNA delivery to N2a cells using Leu-Fect A with and without Trans-Booster. Successful uptake using Leu-Fect A is observed with the addition of Trans-Booster greatly boosting transfection efficiencies.



Silencing of a GFP-tagged mutant HTT (Exon 1) protein in Neuro 2A cells. High efficacy silencing is observed with RJH reagents.



Silencing GFP-tagged mutant HTT (Exon 1) protein in N2a cells using Leu-Fect reagent and Trans-Booster with a GFP siRNA and a control siRNA. GFP expression is efficiently silenced in cells with minimal toxicity.

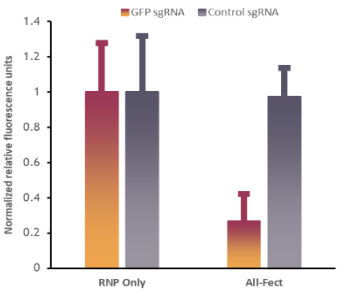


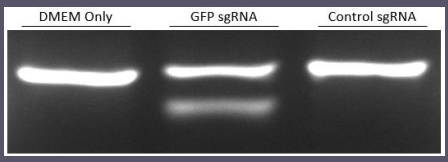
FAM-siRNA transfection into primary neurons (DRGs) using Leu-Fect A and Trans-Booster. High siRNA uptake is observed in most cells (merged fluorescence image showing green siRNA and blue/DAPI stain of nucleus).

Cas9 Transfection

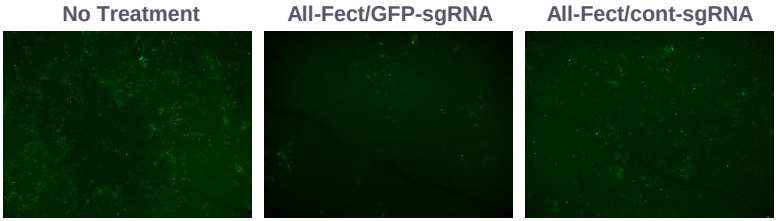
The CRISPR/Cas9 system enables highly specific genome editing using a single guide RNA (sgRNA) and an endonuclease (Cas9 protein). The Cas9 system can be implemented using pDNA or mRNA to express the Cas9 protein in situ, or by transporting a ribonucleoprotein (RNP) complex directly into the cell. RJH reagents have been designed for highly efficient transfection of all three delivery systems.

Transfecting Neuro 2A cells stably expressing GFP-tagged mutant HTT (Exon 1) protein with Cas9/sgRNA RNP complexes using All-Fect. GFP expression was analyzed using spectroscopy. High efficiency gene editing with no discernable toxicity is achieved in the N2a cell line.





T7E1 Assay on the GFP locus of Neuro 2A cells stably expressing GFP-tagged mutant HTT, transfected using All-Fect. Editing of the GFP locus by Cas9 is evident with a GFP-specific sgRNA, but not a non-specific sgRNA.



Fluorescent microscopy of N2a cells stably expressing GFP-tagged mutant HTT, edited using Cas9/sgRNA RNP complexes transported with All-Fect. Transfection with GFP sgRNA shows high efficiency with minimal toxicity (as observed with control sgRNA).

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