PRECISION NANOSYSTEMS

Create Transformative Medicines™

GenVoy-ILM™

T Cell Kit for mRNA

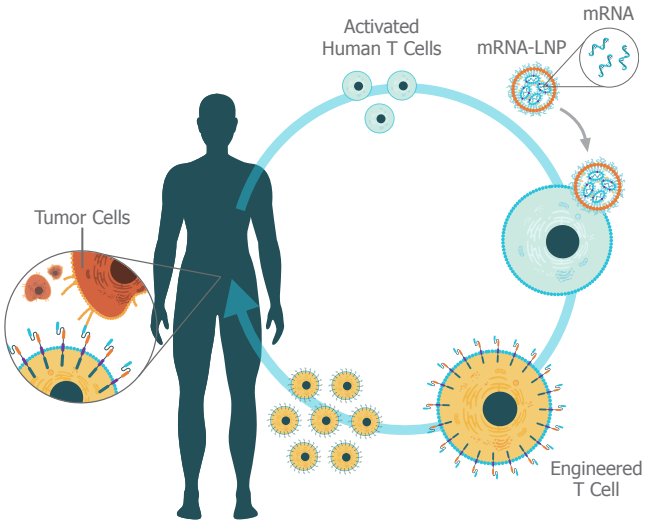
on NanoAssemblr® Spark™

Rethink Cell Therapy
with Lipid Nanoparticles

Rethink T Cell Gene Delivery With GenVoy-ILM T Cell Kit for mRNA

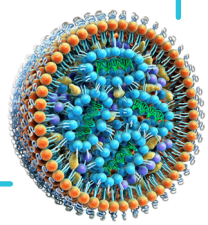
Lipid Nanoparticle (LNP) based technology enables researchers to establish a clinically relevant, scalable method for *ex vivo* gene delivery to advance the development of cell therapies.

The GenVoy-ILM T Cell Kit for mRNA is an LNP reagent mix optimized for the delivery of mRNA into activated primary human T cells using mRNA-LNPs formulated on the NanoAssemblr® Spark™ instrument and cartridges. It can be used at various stages of cell therapy research and development from discovery to preclinical.

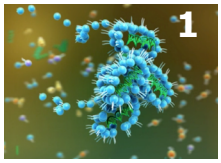


Why use the GenVoy-ILM T Cell Kit for mRNA for *ex vivo* gene delivery into T cells?

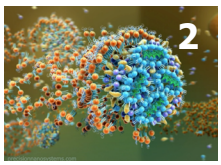
- Greater Proportion of Engineered T Cells
- Uniform Cellular Protein Expression
- Highly Viable T Cells
- A Simple Protocol with Minimal T Cell Manipulation



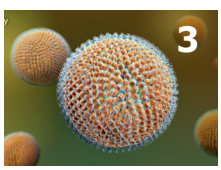
mRNA-LNPs leverage endogenous cellular uptake mechanisms



GenVoy-ILM contains an ionizable cationic lipid, which at low pH mediates efficient encapsulation of mRNA

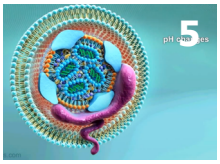


The mRNA-lipid core is surrounded by helper lipids, cholesterol and stabilizers to form the mRNA-LNP

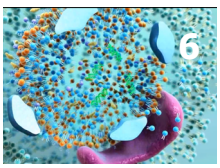


Once formed, mRNA-LNP are neutral at physiological pH which eliminates a main source of toxicity present in other mRNA delivery methods

mRNA-LNP mimic low density lipoproteins (LDL) and are then taken up through receptor-mediated endocytosis



Once in the endosome, ionizable lipids in mRNA-LNP respond to low pH and become cationic

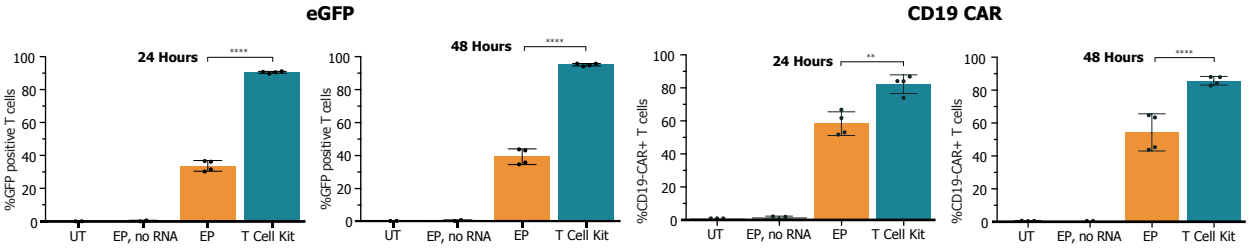


The cationic lipids in the mRNA-LNP interact with anionic lipids in the endosome and release the mRNA into the cytoplasm

GenVoy-ILM T Cell Kit for mRNA: A New Way to Deliver mRNA *Ex Vivo*

Greater Proportion of Engineered Cells

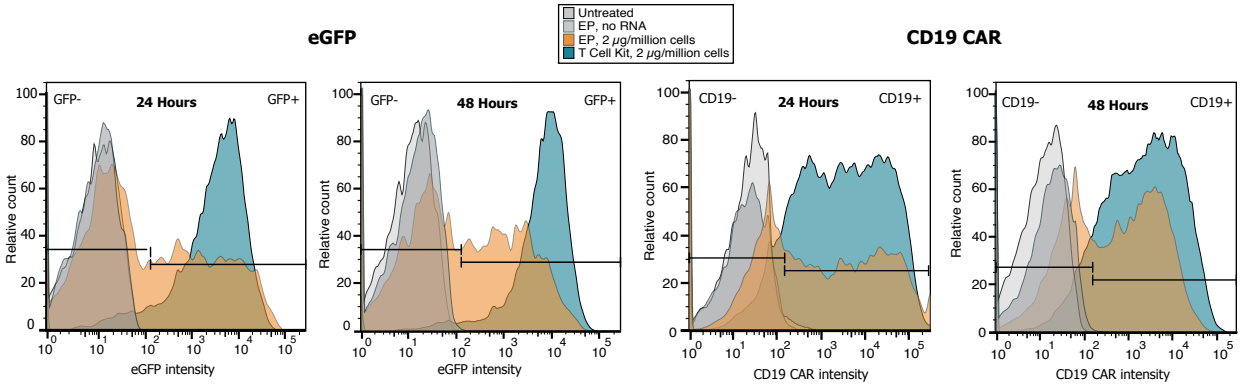
Delivering mRNA into activated human primary T cells using the kit leads to a higher proportion of engineered T cells, making it a more potent gene delivery method than electroporation.



Transfection efficiency was measured by protein expression via flow cytometry at 24 and 48 hours post treatment. Electroporation (EP) was performed by following the manufacturer's protocol, and LNP treatment was performed following the T Cell Kit for mRNA on Spark protocol. Untreated cells (UT) were used as control. **p<0.01, ****p<0.0001 by one-way ANOVA.

Uniform Cellular Protein Expression

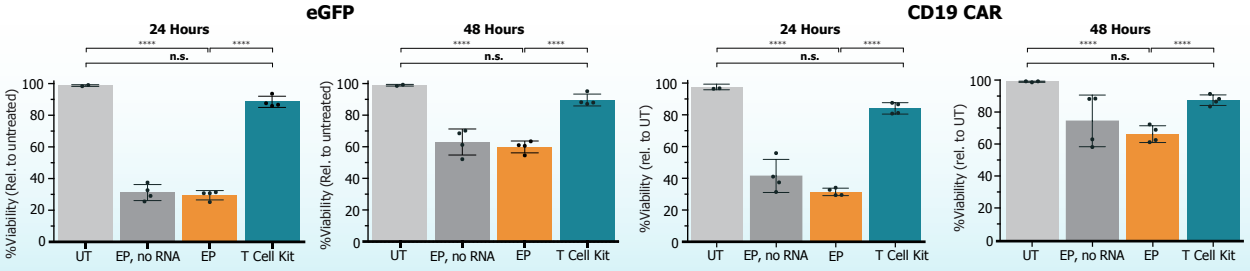
Engineering T cells using the kit results in uniform protein expression across the treated cell population.



Representative mean fluorescence intensity (MFI) plots of cell surface protein expression were generated using flow cytometry at 24 and 48 hours post treatment. Electroporation (EP) was performed by following manufacturer's protocol, and LNP treatment was performed following the T Cell Kit for mRNA on Spark protocol. Untreated cells (UT) were used as control.

High Cell Viability

Activated human primary T cells remain highly viable after *ex vivo* gene delivery using the kit.



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A New Method to Advance T Cell Therapy

A simple protocol with minimal T cell manipulation

GenVoy-ILM T Cell Kit for mRNA

Day 1
- Prepare and Activate T Cells

Day 2 and 3
- Maintain Cell Culture

Day 3*
- Prepare mRNA Solution
- Formulate mRNA-LNPs

Day 4
- Plate Cells
- Treat with mRNA-LNPs
- Incubate

*1 Hour Process

Day 5
- Perform ELISA/Flow Cytometry

Day 6+
- Perform *In Vitro* Experiments
- Perform *In Vivo* Experiments

Electroporation

Day 1
- Prepare and Activate T Cells

Day 2 and 3
- Maintain Cell Culture

Day 4*
- Centrifuge and Wash Cells
- Resuspend Cells in a Specialized Buffer
- Place Cells in Cuvette and Electroporate
- Remove Cells from Cuvette and Place into Media
- Rest Cells Overnight

*24 Hour Process

Day 5
- Plate Cells
- Incubate

Day 6
- Perform ELISA/Flow Cytometry

Day 7+
- Perform *In Vitro* Experiments
- Perform *In Vivo* Experiments

Advantages of GenVoy-ILM T Cell Kit for mRNA

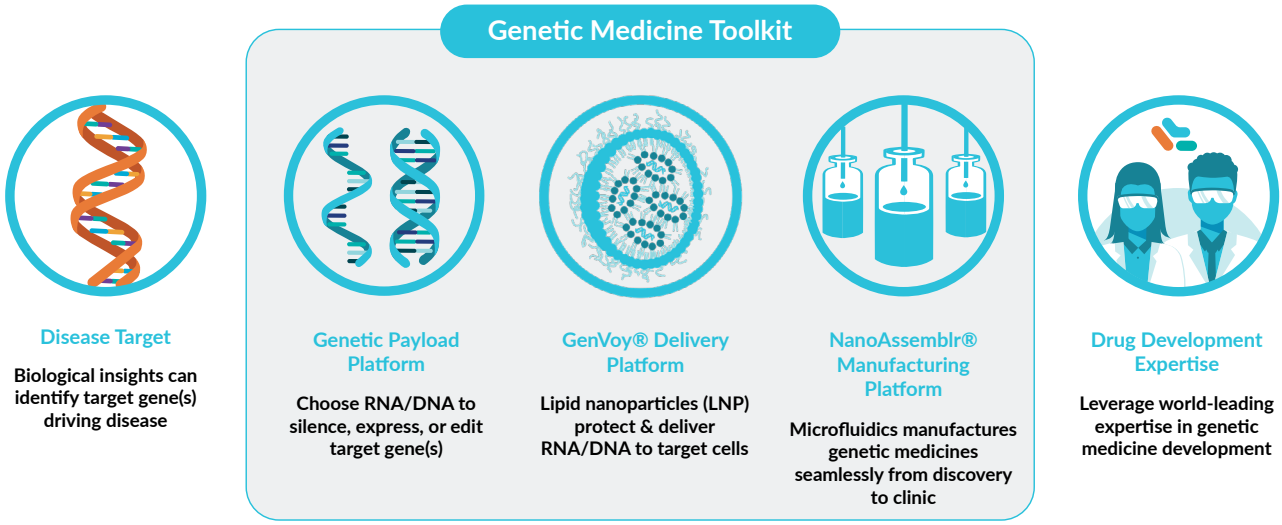
GREATER PROPORTION OF ENGINEERED CELLS

HIGH CELL VIABILITY

UNIFORM CELLULAR PROTEIN EXPRESSION

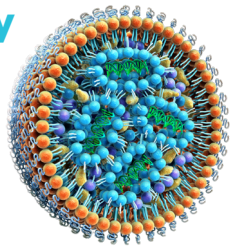
Lipid Nanoparticles Empower Genetic Medicine Development

Precision NanoSystems' Genetic Medicine Toolkit uses the GenVoy LNP Delivery Platform to support the rapid and cost-effective development of genetic vaccines, gene therapies and cell therapies. PNI's technology platforms and expertise enable researchers to translate biological insights into treatments for areas of unmet need such as infectious disease, rare disease and cancer.



Lipid Nanoparticles Are a Clinically Validated Delivery Technology

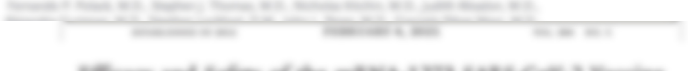
LNPs have been clinically validated to successfully deliver RNA, from the first approved siRNA-LNP Onpattro®, to mRNA-LNP COVID-19 vaccines from Moderna and Pfizer/BioNTech.



First RNA-LNP Vaccine for Widespread Use

Pfizer/BioNTech developed and manufactured an mRNA-LNP vaccine for COVID-19 in less than a year and was the first approved for emergency use by the FDA.

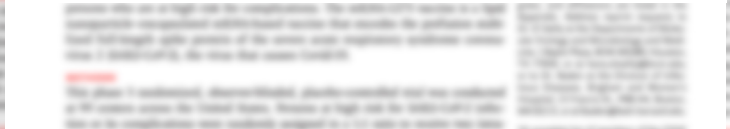
Polack et. al. NEJM. 2020.



RNA-LNP Vaccines Are Rapidly Developed

Moderna was the first mRNA-LNP COVID-19 vaccine, starting human clinical trials in 66 days of viral sequencing, and was approved by the FDA within a year.

Baden et al. NEJM. 2020.

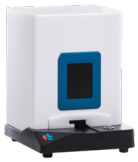


RNA-LNP Drugs Can Treat Rare Disease

In 2018, Alnylam received authorization for Patisiran, the first siRNA-LNP drug to be offered for commercial use, to treat hATTR amyloidosis.

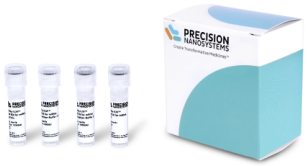
Adams et al. NEJM. 2018.

Ordering Information

T CELL KIT FOR mRNA		PRODUCT NUMBER
	GenVoy-ILM T Cell Kit for mRNA	1000701
	GenVoy-ILM T Cell Kit for mRNA with Spark Cartridges	1000683
INSTRUMENTS, CARTRIDGES AND ACCESSORIES		
	**NanoAssemblr Spark**	NIS0001
	NanoAssemblr Spark Cartridges (20 pack, 80 pack)	NIS0009 NIS0013

A Powerful Method to Engineer T Cells

NanoAssemblr Spark Instrument & Cartridges



GenVoy-ILM T Cell Kit for mRNA

Deliver mRNA into Activated Human Primary T Cells

About Precision NanoSystems

PNI is a global leader ushering in the next wave of genetic medicines in infectious diseases, cancer and rare diseases. We work with the world's leading drug developers to understand disease and create the therapeutics and vaccines that will define the future of medicine. PNI offers proprietary technology platforms and comprehensive expertise to enable researchers to translate disease biology insights into non-viral genetic medicines.

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