

Product Catalog



NanoGenerator™
Nanoparticle Synthesis



NanoGenerator™

Nanoparticle Synthesis System



Microfluidic Mixing System

Nanoparticle synthesis by microfluidic technology presents advantages over the conventional batch synthesis processes due to its superior control of size and shape.

PreciGenome's NanoGenerator™ applies microfluidic approaches to synthesize nanoparticles in a continuous mode. The systems have been widely used in various applications in the drug delivery field, such as lipid nanoparticles (LNP), liposomes, PLGA nanoparticles etc.

- Controllable particle size
- Low PDI
- High encapsulation efficiency
- High reproducibility

System Benefits

High Performance & Efficiency



- Tunable size (40-200 nm)
- Low PDI
- High encapsulation efficiency

Open Platform



- Reagents
- Microfluidic chips

Scalable Throughput



- Flex S: 0.1-2 mL
- Flex M: 1-12 mL
- Pro: 2-200 mL
- Max: 200 mL-1 L

Simple Operation



- Easy setup
- Compact size
- Intuitive UI w/ touchscreen

Cost Effective



- Affordable configuration
- Low cost consumables

Custom design & OEM



- Research collaboration
- Custom design
- OEM & Contract manufacturing

Payloads

- DNA/mRNA/siRNA
- Proteins and peptides
- Small molecule drugs
- Other payloads

Email: USSales@precigenome.com
Tel: +1-408-708-4602

Address: 2176 Ringwood Ave., San Jose, CA, USA
Visit us at www.precigenome.com

NanoGenerator™ System Models

Discovery &
Screen



NanoGenerator™ Flex

Scientific research, screening and discovery for quick low-volume preparation

Flex-S: 0.1 to 2 mL throughput
Flex-M: 1 to 12 mL throughput



Screen & Develop

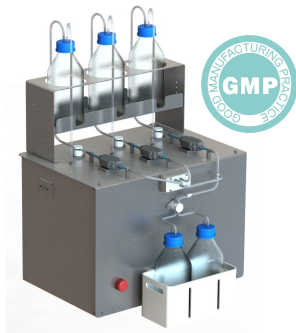


NanoGenerator™ Pro

Preclinical Studies and Development

Pro: 2 to 200 mL throughput

Scale-up



NanoGenerator™ Max (cGMP version)

Clinical development
cGMP certified manufacturing

Max: 1 L throughput
Max+: >10 L throughput
(available soon)

Custom solution



NanoGenerator™ OEM

Custom design and OEM solutions
GMP certified manufacturing

High volume: >20 L throughput
High throughput: 32/64 samples per run

System Applications

Nucleic Acid Lipid Nanoparticles

- mRNA vaccines
- Rare genetic diseases
- Gene & cell therapy
- CAR-T therapeutics

Liposomes

- Cancer therapy
- Vaccine Adjuvant
- Antimicrobial therapy
- Cosmetics

Polymer Nanoparticles

- Cancer chemotherapy
- Immunology & vaccines
- Insulin delivery for diabetes

NanoGenerator™ Flex-S Nanoparticle Synthesis System



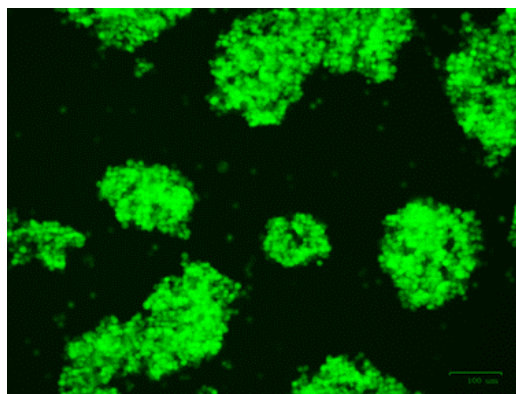
NanoGenerator™ Flex-S nanoparticle synthesis system

PreciGenome's NanoGenerator™ Flex-S design is for small scale production. The throughput volume range is from 0.1 to 2mL, which is perfect for formulation screening and early discovery applications.

Smaller output volume (<0.2ml per run) is achievable by recipe optimization.

Model	NanoGenerator™ Flex-S
Mixing Cartridge	CHP-MIX-4
Throughput	0.1 to 2 mL
Total Flow Rate	3 mL/min
Flow Rate Ratio (W:O)	3:1
Size Range	40 to 200 nm
PDI	0.05 to 0.2
Encapsulation Efficiency	85-95%
Payloads	DNA, mRNA, siRNA, protein, small molecules

eGFP mRNA LNP Delivery to Jurkat Cells



Jurkat Cells transfected with Formulation #9. Green fluorescence image at 48 hours post transfection.

Example of Formulation Screening by Flex-S

Screening Panel			LNP Characterization			Cell Study
Formulation	Ionizable Lipid	N/P Ratio	Size (nm)	PDI	EE%	GFP expression
#1	40%	3.57	56.6	0.19	86%	+
#2	40%	5.35	79.9	0.246	84%	+
#3	40%	8	75.2	0.214	85%	++
#4	60%	5.35	128.5	0.13	81%	NA
#5	40%	5.35	62.8	0.186	90%	++
#6	40%	8	54.3	0.184	93%	++
#7	50%	8	79	0.155	88%	+
#8	50%	11	82.2	0.126	90%	NA
#9	50%	8	87.5	0.12	91%	+++

Email: USSales@precigenome.com

Tel: +1-408-708-4602

Address: 2176 Ringwood Ave., San Jose, CA, USA

Visit us at www.precigenome.com/nanoparticle-

NanoGenerator™ Flex-M Nanoparticle Synthesis System

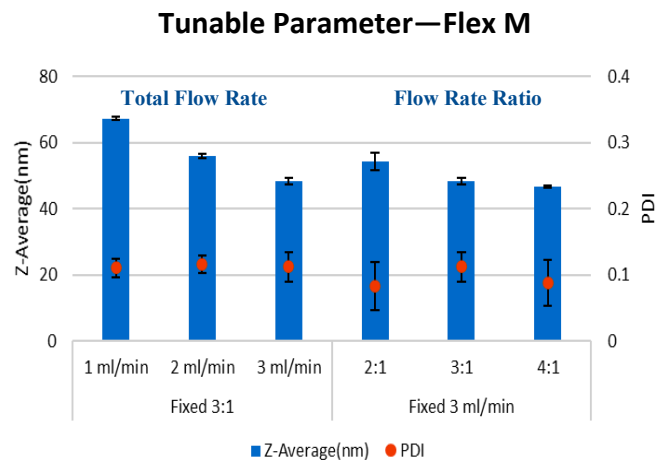


NanoGenerator™ Flex-M nanoparticle synthesis system

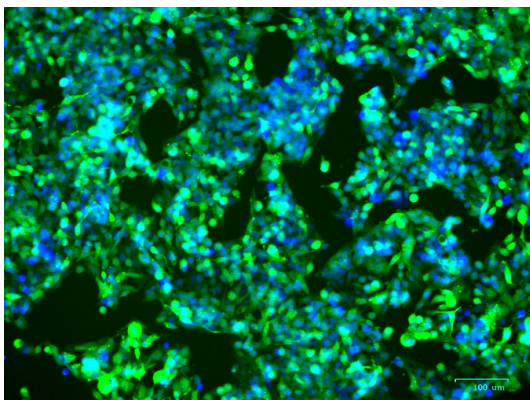
PreciGenome's NanoGenerator™ applies microfluidic approaches to synthesize nanoparticles (LNP, liposome, PLGA, etc.) in a continuous mode. NanoGenerator™ Flex-M system provides a wide throughput range from 1 to 12 mL, which meets a variety of applications from early screening to animal studies.

Flex-M system also provides an in-line dilution option to reduce ethanol concentration instantly. It further stabilizes LNP products.

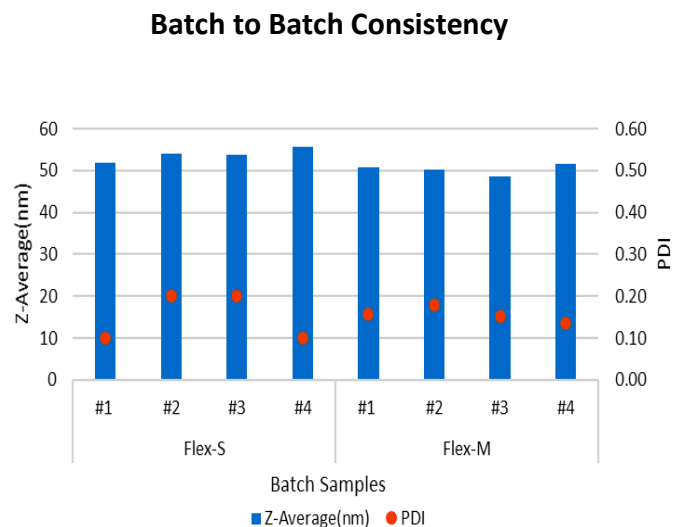
Model	NanoGenerator™ Flex-M
Mixing Cartridge	CHP-MIX-4
Throughput	1 to 12 mL
Total Flow Rate	1 to 3 mL/min
Flow Rate Ratio (W:O)	2:1 to 5:1
In-line Dilution (optional)	0.5:1 to 2:1
Size Range	40 to 200 nm
PDI	0.05 to 0.2
Encapsulation Efficiency	85-95%



mRNA LNP Synthesis



HepG2 cells were successfully transfected by eGFP mRNA LNP. Cell nuclei were stained with Hoechst 33342 dye (blue color) before imaging.



Case Study:



T Cell Transfection by mRNA Lipid Nanoparticles

Since the first FDA approval of chimeric antigen receptor (CAR) T cell therapy in 2017, T cell engineering is continuously the hottest research field in immunotherapy and cell therapy. Current CAR T cell engineering methods use viral transductions, which induce permanent CAR expression and have potential safety concerns. To overcome these concerns, researchers are highly interested in non-viral gene delivery methods.



Recently, CAR mRNA lipid nanoparticles (LNPs) in T cell engineering have been widely studied. The transient transduction feature of mRNA LNP make it a safer profile than viral vectors. The size, homogeneity and mRNA encapsulation efficiency are the key factors for efficient T cell transfection. Using PreciGenome's NanoGenerator™ system, customer can produce mRNA LNPs with well controlled size, high homogeneity and excellent encapsulation efficiency.

The following data shows the size and PDI of GFP mRNA lipid nanoparticles synthesized by NanoGenerator™ Flex system. The transfection efficiency to K562 and HepG2 cell lines and human primary T cells are presented in Figure 2 and 3.

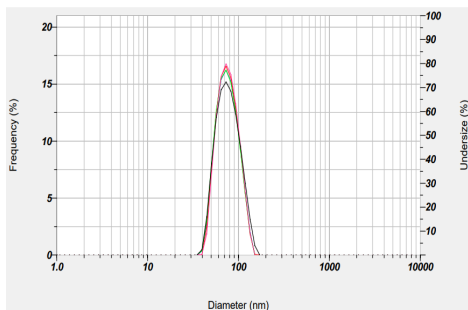


Figure 1. GFP-LNP Synthesized by PreciGenome's NanoGenerator™ Flex-S. Average sizes is 67.3 nm. PDI is 0.106.

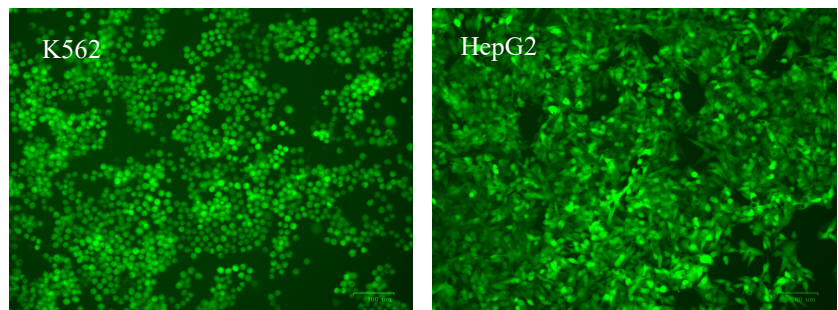
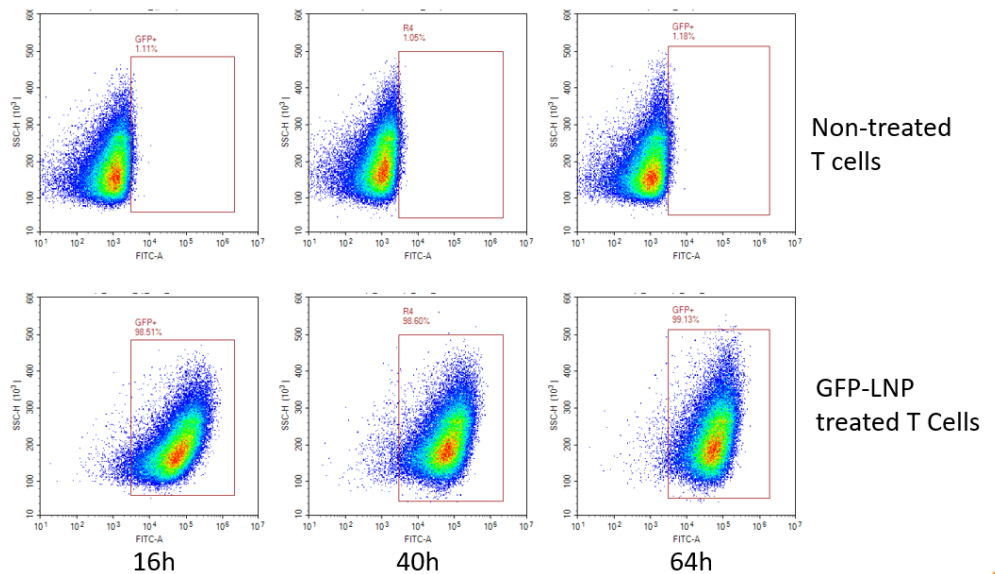


Figure 2. GFP expression in K562 (left) and HepG2 (right) cell lines after 48 hours treated by GFP-LNP synthesized by PreciGenome's NanoGenerator™ Flex-S.

Figure 3. GFP(+) positive population of control (non-treat) and eGFP LNP treated primary T cells at 16, 40 and 64 hours. Cells were stained (1:50) using Biolgend 7-AAD Viability Staining for 10 minutes. Gating: First select for individual cells (excluding doublets). Then select for healthy cell population. Then select for viable cells by excluding cells which are positive for 7-AAD. Gate for FitC-A channel (GFP).

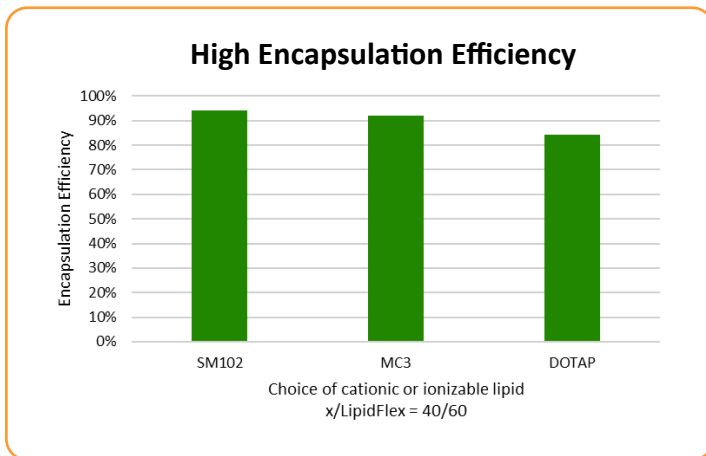
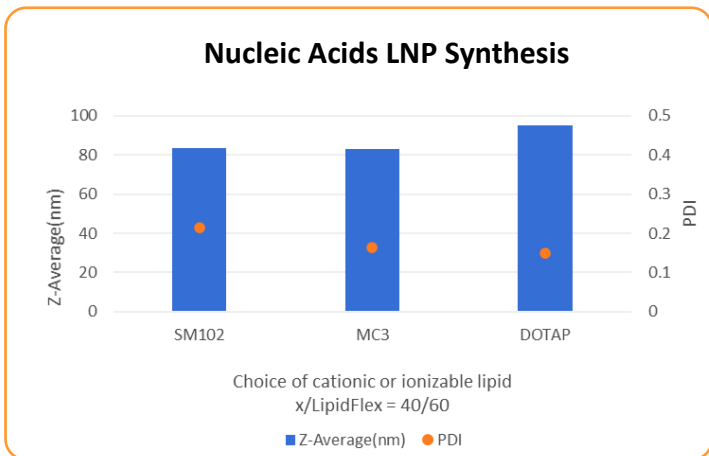
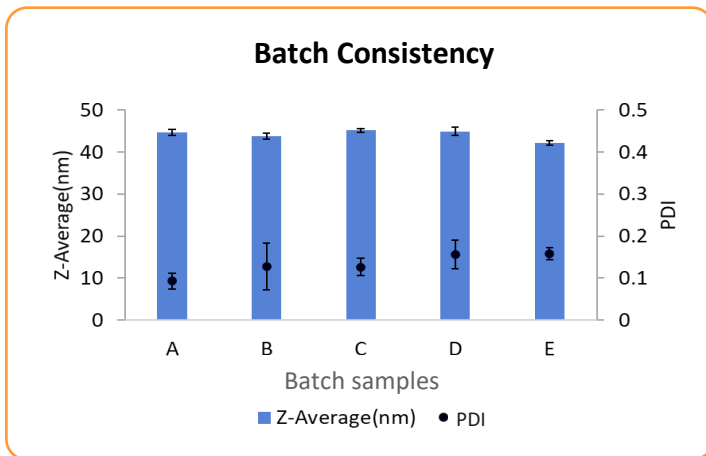
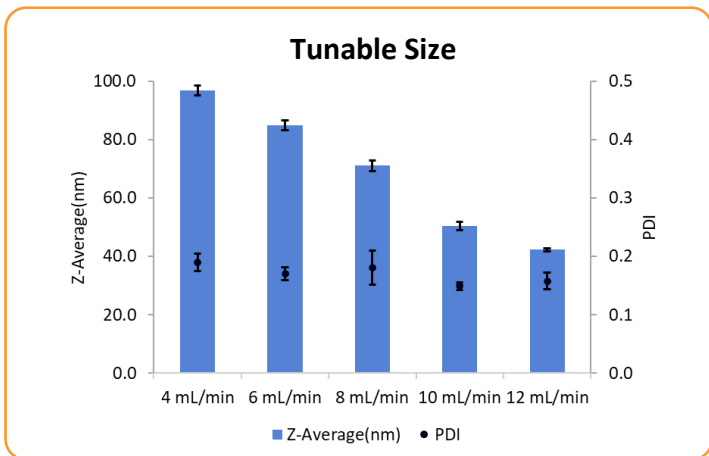




NanoGenerator™ Pro

Nanoparticle Synthesis System

PreciGenome's NanoGenerator™ Pro is an integrated nanoparticle synthesis system. NanoGenerator™ Pro contains more powerful pressure control modules, which provide higher throughput from 2 to 200mL. The total flow rate range is from 4 to 12mL/min. The flow rate ratio (W:O) is between 2:1 to 5:1.



Cell Transfection using GFP mRNA LNP

Green: GFP expression
Blue: Hoechst (nucleus)

Fluorescence Field

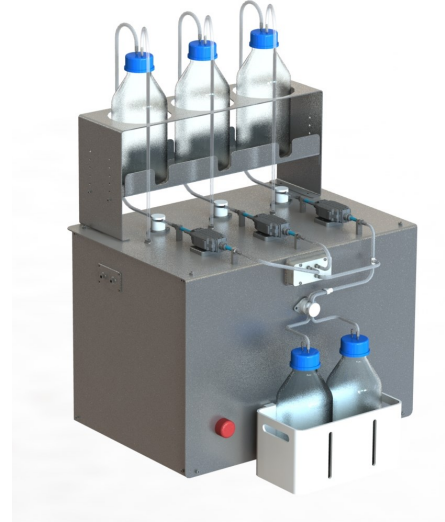
Bright Field

Model	NanoGenerator™ Pro
Mixing Cartridge	CHP-MIX-3
Throughput	2 to 200 mL
Total Flow Rate	4-12 mL/min
Flow Rate Ratio (W:O)	2:1 to 5:1
Size Range	40 to 200 nm
PDI	0.05 to 0.2
Encapsulation Efficiency	Up to 99%
Payloads	DNA, mRNA, siRNA, protein, small molecules

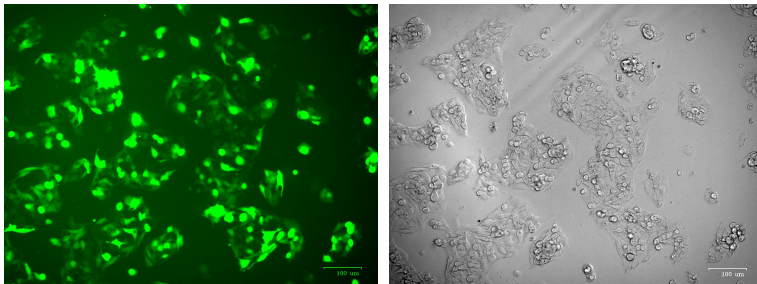
NanoGenerator™ Max Nanoparticle Synthesis System (cGMP Version)

PreciGenome's NanoGenerator™ applies microfluidic approaches to synthesize nanoparticles in a continuous mode. The system has been widely used in the drug delivery field for a variety of applications, such as synthesis of lipid nanoparticles (LNP), liposomes, PLGA, etc.

NanoGenerator™ Max (cGMP version) is designed for clinical and commercial production (200mL-1L, 10L+). With PreciGenome's microfluidics technology, customers can easily and seamlessly transfer their early discovery results (NanoGenerator™ Flex, Pro) to late stage production (NanoGenerator™ GMP).



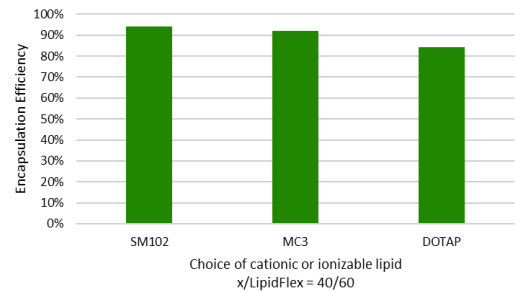
Cell Transfection using GFP DNA LNP



Fluorescence Field

Bright Field

High Encapsulation Efficiency



Model	NanoGenerator™ Max	NanoGenerator™ Max+
Throughput	200mL to 1L	>= 10L
Total Flow Rate	>1L/hour	>10L/hour
Size Range	40 to 200 nm	40 to 200 nm
PDI	0.05 to 0.2	0.05 to 0.2
Encapsulation Efficiency	Up to 99%	Up to 99%
Payloads	DNA, mRNA, siRNA, protein, small molecules	DNA, mRNA, siRNA, protein, small molecules
Inline Dilution	Optional	Optional



BASIC FEATURES

	Flex-S	Flex-M	PRO	MAX	MAX (cGMP)
Product Model Number	PG-SYN-FS	PG-SYN-FM	PG-SYN-P	PG-SYN-M	PG-SYN-G
R&D Stage	Screening & Discovery	Screening & Discovery	Preclinical Studies & Development	Preclinical Studies & Development	Clinical Development
Throughput	0.1-2mL	1-12mL	2-200mL	200mL-1L	200mL-1L
Multiple Samples Per Run	✓	✗	✗	✗	✗
Total Flow Rate	3mL/min	1 to 3 mL/min	4 to 12 mL/min	>1L/hour	>1L/hour
Flow Rate Ratio	3:1	2:1 to 5:1	2:1 to 5:1	2:1 to 9:1	2:1 to 9:1
Tunable Flow Rate	✗	✓	✓	✓	✓
Intuitive & Easy To Use	✗	✓	✓	✓	✓
Compact Design	✓	✓	✓	✓	✓
Consumable Cost Per Run	\$	\$	\$	\$\$	\$\$\$

ADDITIONAL FEATURES

Inline Dilution (Optional)	✓	✓	✗	✓	✓
Heating (Optional)	✗	✓	✗	✗	✓
Installation, Training, Warranty	✓	✓	✓	✓	✓
Qualification: IQ/OQ/PQ (Optional)	✓	✓	✓	✓	✓
Licensing Agreement & Royalty	✗	✗	✗	✗	✗
Custom Design/ OEM	✓	✓	✓	✓	✓

LipidFlex™

Flexible Lipid Nanoparticle Formulation

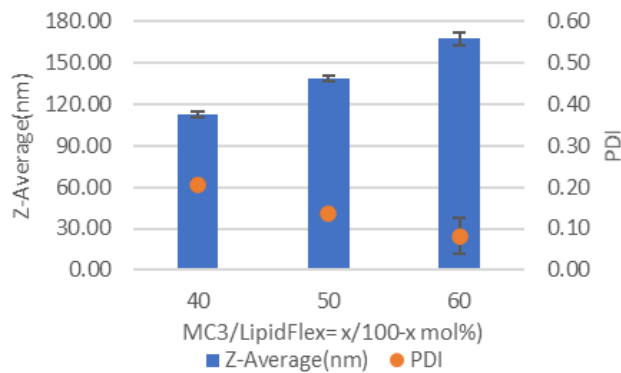
LipidFlex™ is a 3-component lipid nanoparticle formulation that compatible with various cationic/ionizable lipids for nucleic acid encapsulation and cell transfection.

- Flexible cationic/ionizable lipid ratio
- Flexible with various N/P ratio
- High nucleic acid encapsulation efficiency
- High mammalian cell transfection rate

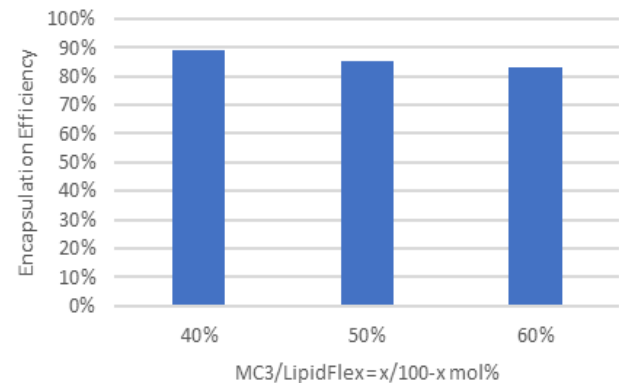


Model	LipidFlex™
Catalog #	PG-SYN-LF1ML
Components	Structural Lipid/ Cholesterol/Stabilizer
Product Size	1000 µL
LipidFlex Conc.	30 mM
Ionizable Lipid	NA

Size & PDI

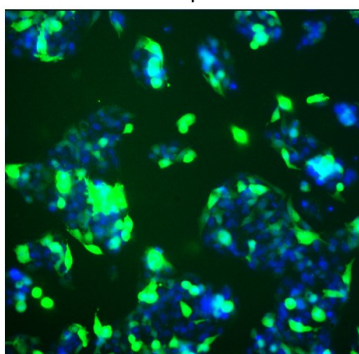


Encapsulation Efficiency



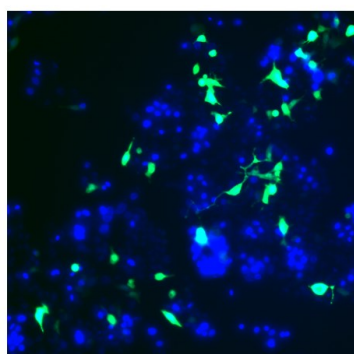
LipidFlex™ Experiment: HepG2 Cell Transfection Efficiency

Sample



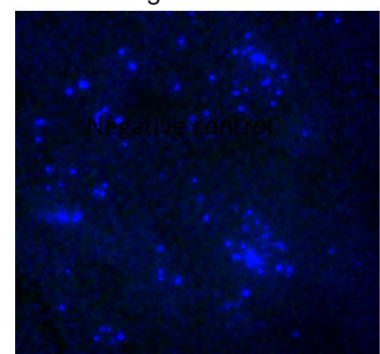
DNA LNP, PreciGenome NanoGenerator SM102/PG-LipidFlex = 40/60 mol%

Positive control



Lipofectamine™ 3000 (Thermo Fisher)

Negative control



Non-treat

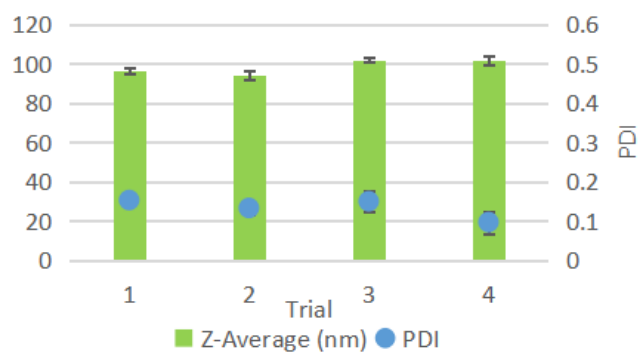
PLGA Nanoparticles (PNP) Synthesis With NanoGenerator™

PreciGenome's NanoGenerator™ is used for the synthesis of a variety of nanoparticles. Some of these include lipid nanoparticles (LNP), liposomes and PLGA.

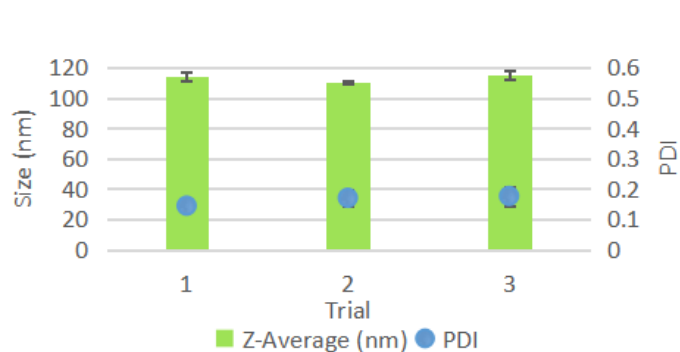
For PLGA nanoparticle (PNP) synthesis, successful batch to batch consistency is empowered by the advanced microfluidic technology used in the CHP-MIX-4 (Flex-S) and the CHP-MIX-3 (Flex-M and PRO). This shows the ease of scaling up as this batch to batch consistency applies from a small throughput range (Flex: 0.1-12mL) across a wide through put range (PRO: 2mL-200mL)

PNP size tuning is controlled by the formulation parameters, the total flow rate and the flow rate ratio.

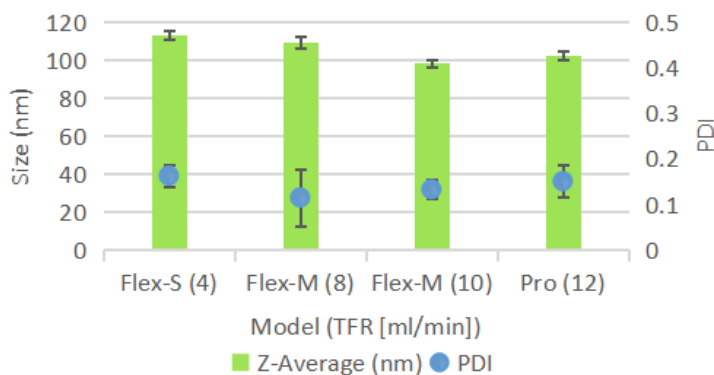
Batch to Batch Consistency (Flex-M)



Batch to Batch Consistency (Flex-S)



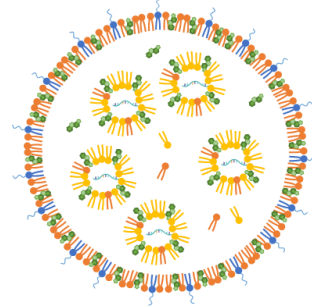
NanoGenerator™ Model Comparison



LipidFlex™ T Cell Kit

High Efficient mRNA LNP Formulation for T Cell Transfection

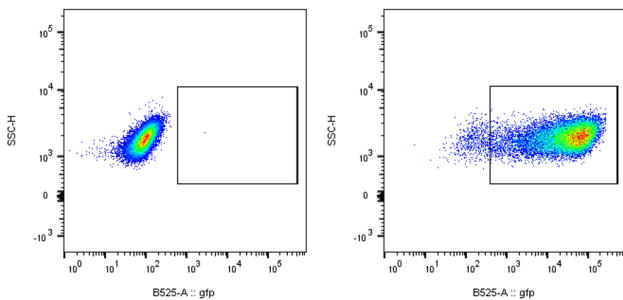
LipidFlex™ T cell kit is a highly efficient lipid formulation to synthesize mRNA lipid nanoparticles for primary human T cell gene delivery. Using NanoGenerator™ Flex-S system and CHIP-MIX-4 cartridge, customers can prepare potent mRNA LNP in a convenient and efficient way.



- Narrow size distribution of mRNA LNP
- High transfection efficiency
- High protein expression level
- High cell viability
- Time efficient synthesis process

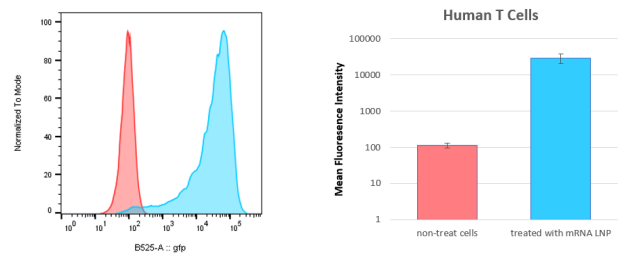
Component	Size	Storage
LipidFlex T Lipid mix	125 µL	-80 °C
Formulation Buffer 1 (10x)	50 µL	4 - 8 °C
Formulation Buffer 2	1 mL	4 - 8 °C

High Human T Cell Transfection Efficiency



* 24 hours post-treatment Human T cells (eGFP mRNA from Trilink)

High Protein Expression Level

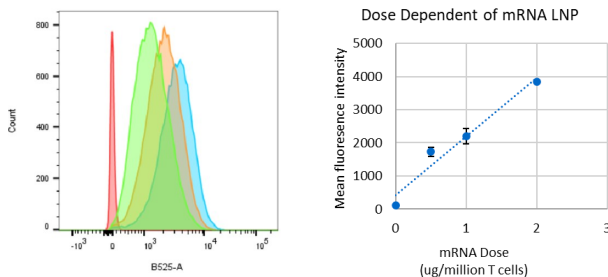


Non-treat cells

Treated with eGFP mRNA LNP

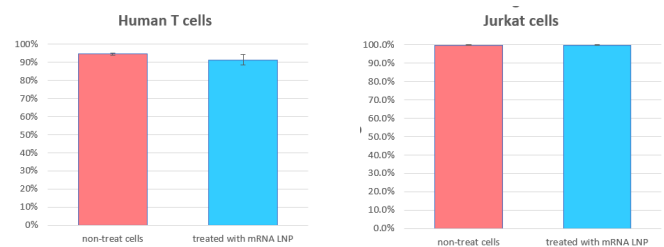
* 24 hours post-treatment Human T cells (eGFP mRNA from Trilink)

mRNA LNP Dose Dependency



* 24 hours post-treatment Jurkat cells (eGFP mRNA from ProMab)

High Cell Viability



* 24 hours post-treatment Human T cells and Jurkat cells

Ordering Information

Platforms		
NanoGenerator™ Flex-S	NanoGenerator™ system, throughput: 0.1mL-1mL	PG-SYN-FS
NanoGenerator™ Flex-M	NanoGenerator™ system, throughput: 1mL-12mL	PG-SYN-FM
NanoGenerator™ Flex	NanoGenerator™ system, throughput: 0.1mL-12mL, S and M module	PG-SYN-F
NanoGenerator™ Pro	NanoGenerator™ system, throughput: 2mL-200mL, integrated instrument	PG-SYN-P
NanoGenerator™ Max	GMP version nanoparticle synthesis system (available soon)	PG-SYN-G
Microfluidic Cartridge & Consumables		
Mixing cartridge	Microfluidic mixing chip for Flex, 4 devices per chip	CHP-MIX-4
Mixing cartridge	Microfluidic mixing chip for Pro, 3 devices per chip	CHP-MIX-3
Mixing cartridge	Microfluidic glass mixing chip for Flex-M, 1 device per chip	CHP-MIX-G1
Reservoir Connectors	Reagent Reservoirs for Flex-S, 20sets/pack	PG-MRC-SYNS-Q20
Flex-S Gasket	Gaskets for Flex-S, 20pcs/pk	PG-GSK-SYNS-Q20
O-ring Gasket	O-ring gasket for NanoGenerator™ Pro, 50pcs/pk	PG-ORN-SYNP-Q50
Reagents (optional)		
LipidFlex™ kit	3 components lipids mixture, 1mL	PG-SYN-LF1ML
LipidFlex™ T cell kit	T cell transfection kit	PG-SYN-LFT
LipidDemo	Included in the package of the instrument	PG-SYN-LFD
Accessories & Service (optional)		
Flex-S flow unit	Flow unit for Flex-S	PG-SYN-MNTS
Flex-M flow unit	Flow unit for Flex-M	PG-SYN-MNTM
Tubing and connector kit	Standard tuning and connectors for Flex-M	KIT-TUB-FIT-FM
Inline dilution kit	Inline dilution device, tubing and connectors for Flex-M	KIT-INL-DIL-FM
Extended Warranty	1 to 3 years.	PG-WTY-1Y

Customer Service

- **Formulation Design (Lipid NP, Liposome, PLGA)**
Customize liposomes design based on our clients' demand by varying lipid compositions, vesicle size, surface charge, etc.
- **Payload Encapsulation**
Customize protocols to encapsulate drugs into lipid nanoparticles or PLGA with high encapsulation efficiency.
- **Cell Study**
Cell in vitro transfection service.
- **Analysis and Characterization**
Run comprehensive analysis assays for liposomes before and after encapsulation , which includes visual appearance, size distribution, stability, entrapment efficiency, encapsulation efficiency analysis, in vitro release profile analysis, release rate, etc.

Notes



Notes

Some of Our Customers





PreciGenome is located in the heart of Silicon Valley, San Jose, California, USA. We have been focusing on developing nanoparticle synthesis systems and solutions for our customers since we started our business. Our technology enables rapid prototyping with high quality and reliable performance for lipid nanoparticles, liposomes, PLGA, etc.

HEADQUARTER

PreciGenome LLC

Tel: 1-408-708-4602

Email: USSales@precigenome.com

Address: 2176 Ringwood Ave. San Jose, California, USA

TAIWAN DISTRIBUTOR

Ding Fong Scientific Co., Ltd

Tel: 886-4-23595717

Email: ding-fong@ding-fong.com.tw

CHINA DISTRIBUTOR

Suzhou Rainsure Biotech Co. Ltd

Tel: 86-512-67503398

Email: info@rainsurebio.com

KOREA DISTRIBUTOR

InSung Chroma-Tech Co., Ltd.

Tel: 82-226441991

Email: KRSales@precigenome.com

