

nanomake-L[™]: India's first automated microfluidic platform for mRNA LNPs

User-friendly microfluidic platform designed for the rapid optimization and formulation of nanomedicines









Specifications

Flow rate: 100 µL/min to 50 mL/min

No. of Pumps: 3

Syringe sizes: 500 μL, 1, 2.5, 5, 10 mL

Microreactor: Multi-use microreactor

Nanomaterial: Lipid, Polymer, Emulsions

Controls: Total flow rate, flow ratio, sample volume, in-line dilution

Temperature: Ambient to 60°C (optional pre-heater)







nanomake-L[™] for preparation of lipid nanoparticles



			Size (d.nm):	% Intensity:	St Dev (d.nm):
Z-Average (d.nm):	53.46	Peak 1:	64.39	100.0	29.58
Pdl:	0.180	Peak 2:	0.000	0.0	0.000
Intercept:	0.941	Peak 3:	0.000	0.0	0.000
Result quality :	Good				



Fig. (A) shows the robustness of nanomake-L^m in preparation of lipid nanoparticles. The Z-average (diameter-nm) and PDI of the formulation was 53.46 nm ± 0.96 and 0.180 ± 0.02 respectively.

Fig. A



nanomake-L[™] for preparation of lipid nanoparticles



Fig. (B) and (C) show the effect of different flow rate ratios and flow rate on the average diameter and PDI of the prepared nanoparticles. All formulations were prepared in triplicate.

Fig. B

Lipid composition	DOTAP: DSPC: CHOL: DMG PEG 2000 50: 10: 38.5: 1.5
Organic solvent	Ethanol
Aqueous phase	Citrate buffer (50 mM, pH 3)



mRNA Integrity Assessment – nanomake L[™]

1 2 3 4



Fig. (D) is a 1% agarose gel prepared in 1X TAE. Lane 1: mRNA control, Lane 2: mRNA in nuclease-free water pumped through nanomake L[™], Lane 3: mRNA in nuclease-free water pumped through nanomake L[™] post system wash function. Lane 4: ssRNA Ladder (New England Biolabs). mRNA bands (Lane 2 and 3) are intact, similar to control (Lane 1).

1 – Control mRNA 2 – mRNA Before system wash 3 – mRNA After system wash 4 – ssRNA Ladder



nanomake L[™] for preparation of lipid nanoparticles





Lipid composition	ALC-0315: DSPC: CHOL: DMG PEG 2000 50: 10: 38.5: 1.5
Organic solvent	Ethanol
Aqueous phase	Citrate buffer (50 mM, pH 3)
pDNA	DENV1 (4.4 kb), 100 μg
N/P	6
Total flow rate	8 mL/min
Flow rate ratio (Org./Aq.)	1:3

Size (d.nm): % Intensity: St Dev (d.nm): Z-Average (d.nm): 96.30 Pdi: 0.168 Peak 2: 4766 1.1 757.1 Intercept: 0.945 Result quality : Good Size Distribution by Intensity						
Z-Average (d.nm): 96.30 Pd: 0.168 Peak 2: 4766 Intercept: 0.945 Result quality : Good Size Distribution by Intensity				Size (d.nm):	% Intensity:	St Dev (d.nm):
Pdf: 0.168 Peak 2: 4766 1.1 757.1 Intercept: 0.945 Peak 3: 0.000 0.0 0.000 Result quality : Good Size Distribution by Intensity	Z-Average (d.nm):	96.30	Peak 1:	108.2	98.9	42.60
Result quality : Good Size Distribution by Intensity	Pdl:	0.168	Peak 2:	4766	1.1	757.1
Size Distribution by Intensity Size Distribution by Intensity 1	Intercept: Result quality :	Good	Peak 3:	0.000	0.0	0.000
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low rate ratio (Org /Ag) 1.3	fotal flow rate	9	8	mL/min		
	-low rate ratio	o (Org./Aq.)	1:	3		

The size and PDI of the LNPs was determined through Dynamic Light Scattering.



nanomake L[™] for preparation of lipid nanoparticles



Fig. (E) depicts the encapsulation efficiency of the payload (pDNA and mRNA) in the lipid nanoparticles prepared using nanomake-L.

The encapsulation efficiency of the LNPs was determined through Ribogreen Assay.



nanomake L[™] for preparation of lipid nanoparticles



Fig. (F) depicts the effect of sample collection volume on the size and PDI of the lipid nanoparticles prepared using nanomake-L.

The size and PDI of the LNPs was determined through Dynamic Light Scattering.







Polymer type	Poly (DL-lactide-co-glycolide), 50:50 2 mg/mL
Organic solvent	Acetone
Aqueous phase	0.4 % w/v Poloxamer 188 (aq.)
Total flow rate	6 mL/min
Flow rate ratio (Org./Aq.)	1:8

nanomake L[™] for preparation of polymeric nanoparticles

Z-Average (d.nm):	75.80
Pdl:	0.187
Intercept:	0.928
Result quality :	Good

	Size (d.nm):	% Intensity:	St Dev (d.nm):
Peak 1:	92.08	100.0	39.44
Peak 2:	0.000	0.0	0.000
Peak 3:	0.000	0.0	0.000



Fig. (G) shows the robustness of nanomake-L^m in the preparation of polymeric nanoparticles. The formulation's Z-average (diameter-nm) and PDI were 76.60 nm ± 3.96 and 0.185 ± 0.12, respectively.



nanomake L[™] for preparation of polymeric nanoparticles



Fig. (H) and (I) show the effect of different flow rate ratios and flow rate on the average diameter and PDI of the prepared nanoparticles. All formulations were prepared in triplicate.



nanomake L[™] for preparation of polymeric nanoparticles



Fig. (J) shows the effect of residence time on the encapsulation efficiency of the prepared drug-loaded polymeric nanoparticles. All formulations were prepared in triplicate.

			Size (d.nm):	% Intensity:	St Dev (d.nm):
Z-Average (d.nm):	135.2	Peak 1:	164.3	100.0	69.70
PdI:	0.172	Peak 2:	0.000	0.0	0.000
Intercept:	0.947	Peak 3:	0.000	0.0	0.000
Result quality :	Good				



Polymer type	Poly (DL-lactide-co-glycolide), 50:50 1% w/v
Organic solvent	Acetonitrile
Aqueous phase	1 mg/mL Bovine Serum Albumin (BSA) in 1% Poloxamer-188 (aq.)
Residence Time	0.01-1 second
Flow rate ratio (Org./Aq.)	1:3



Next Steps & Contact Information



Request a Demonstration

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