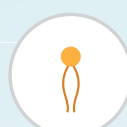


Lipid Components

Lipids are critical components of LNPs. The versatility of LNPs is achievable in part through the diversity of lipids available for these applications. Lipids can be used to tailor the behavior and properties of LNPs for various applications.

Key Lipid Types



Ionizable Cationic Lipids

- Protect nucleic acid payloads
- Improve biocompatibility
- Promote endosomal escape



PEGylated Lipids

- Increase biocompatibility
- Prevent LNP clearance by immune system



Sterol Lipids

- Improve LNP stability
- Promote cellular uptake



Glycerophospholipids

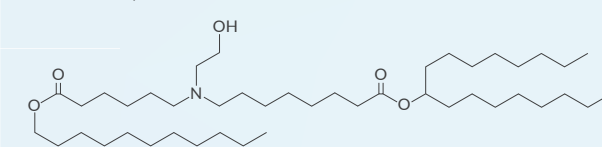
- Improve LNP stability
- Fine-tune physicochemical properties

Notable Ionizable Cationic Lipids

Ionizable cationic lipids have great structural and functional diversity, endowing them with unique properties for specific delivery applications. Some notable ionizable cationic lipids have been used in LNPs for vaccine development, gene editing, rare disease therapies, and CAR T cell applications.

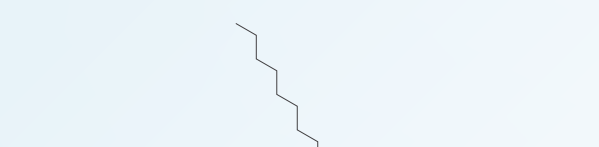
SM-102 - Item No. 33474

- mRNA, pDNA



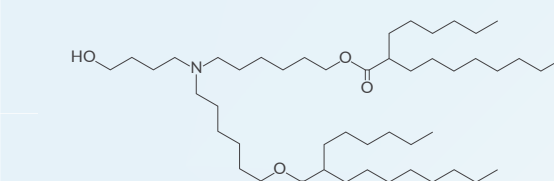
C12-200 - Item No. 36699

- mRNA, siRNA, saRNA



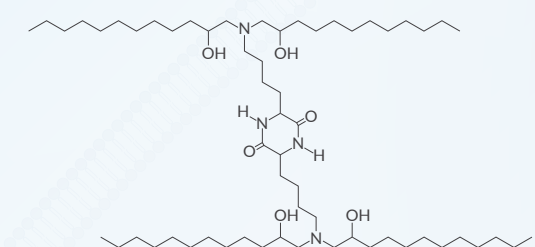
ALC-0315 - Item No. 34337

- mRNA, siRNA, pDNA



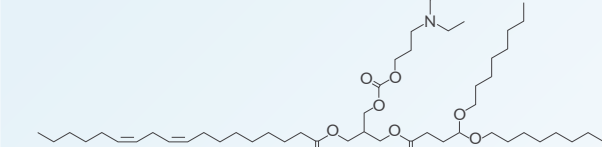
cKK-E12 - Item No. 36700

- mRNA



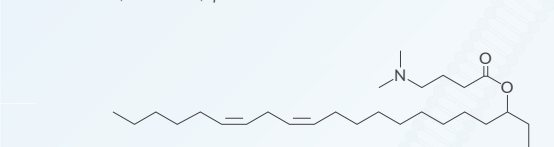
LP-01 - Item No. 37278

- Cas9 mRNA, sgRNA



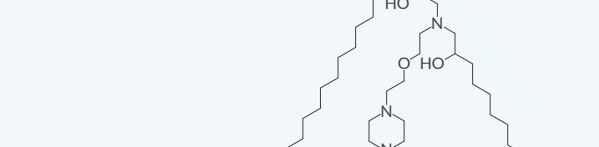
DLin-MC3-DMA - Item No. 34364

- mRNA, siRNA, pDNA



C14-4 - Item No. 38942

- mRNA



Find all products, services, and resources for LNPs at www.caymanchem.com/lmps

LNP Formulation & Development

LNPs are prepared by rapidly mixing an ethanolic lipid solution with an acidic aqueous buffer containing the cargo. The lipids self-assemble into LNPs encapsulating the nucleic acid cargo, protecting the cargo from degradation and promoting cellular uptake.

Lipid Selection

- Lipid species
- Lipid pK_a
- N:P ratio
- Target cell
- Molar ratio

Cargo Selection

- Cargo type
- Application
- Site of action
- N:P ratio

Mix ethanolic lipid mixture and acidic aqueous cargo solution

Mixing Parameters

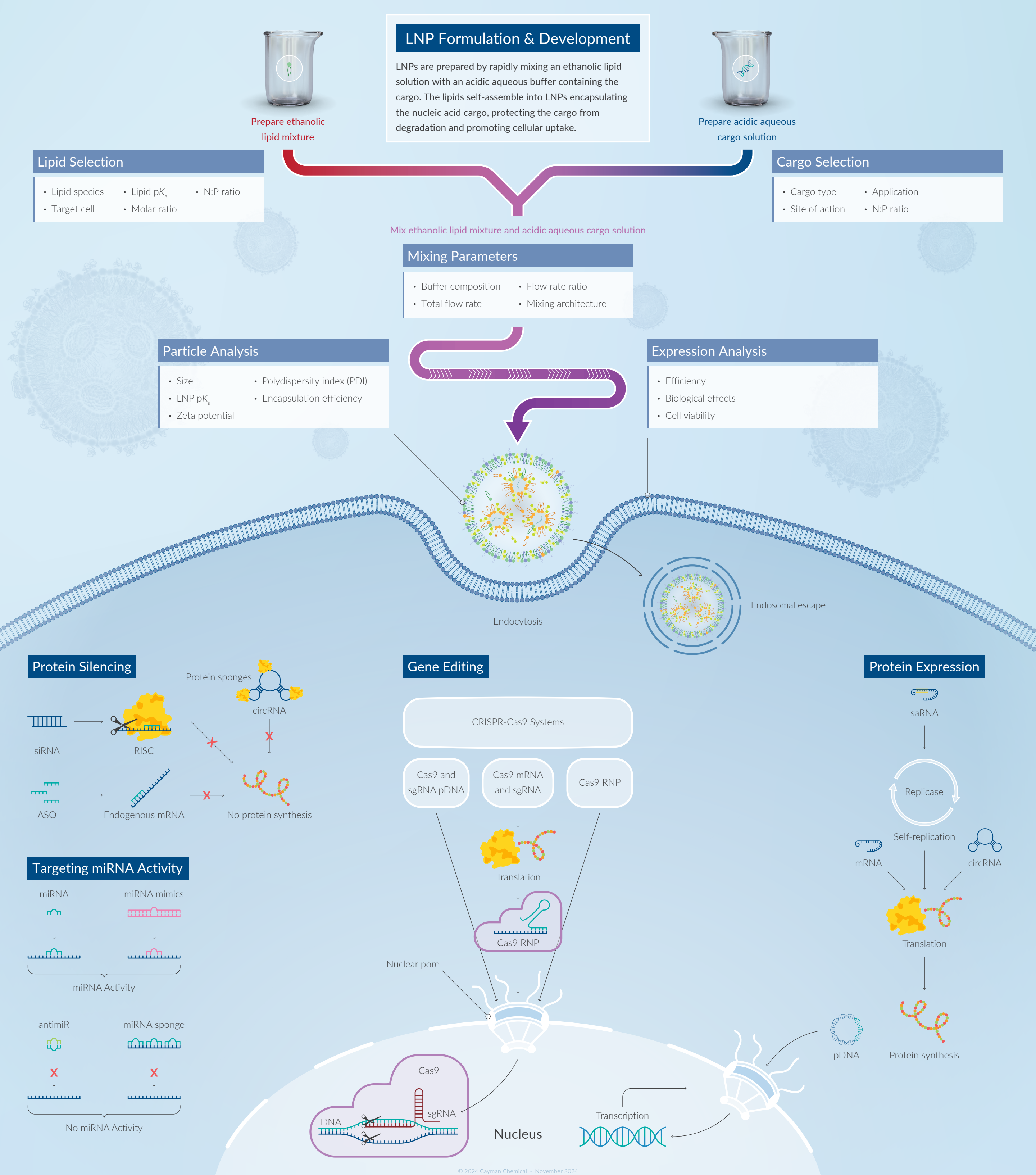
- Buffer composition
- Flow rate ratio
- Total flow rate
- Mixing architecture

Particle Analysis

- Size
- LNP pK_a
- Zeta potential
- Polydispersity index (PDI)
- Encapsulation efficiency

Expression Analysis

- Efficiency
- Biological effects
- Cell viability



Cargo Types

LNPs are tunable delivery systems for a wide range of nucleic acid cargoes. Their ability to protect these sensitive cargoes from degradation and facilitate cellular uptake are key advantages of LNPs.



mRNA

Messenger RNA (mRNA) is a single-stranded RNA that carries instructions for protein synthesis in the cytosol.



miRNA

MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression.



siRNA

Small interfering RNA (siRNA) is a double-stranded RNA that inhibits mRNA translation, blocking protein synthesis.



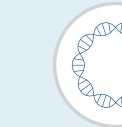
saRNA

Self-amplifying RNA (saRNA) self-replicates upon cytosolic delivery, requiring less RNA cargo and promoting a long duration of protein expression.



ASO

Antisense oligonucleotides (ASOs) bind complementary RNA targets, inducing their degradation.



pDNA

Plasmid DNA (pDNA) carries therapeutic genes to human cells, where it must be transported into the nucleus.



CRISPR-Cas9

CRISPR-Cas9 is a gene editing tool that permits the removal, addition, or alteration of a sequence in cellular DNA.



circRNA

Circular RNA (circRNA) is a single-stranded RNA with a circular structure, improving stability and promoting long duration of protein expression.

Targeting Mechanisms

By leveraging various targeting strategies, LNPs can be recognized and taken up by specific organs, tissues, and cells during *in vivo* delivery.

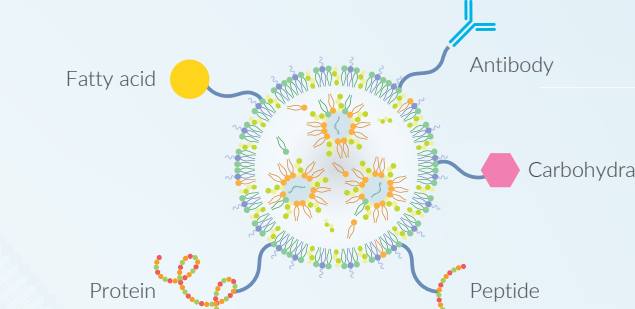
Passive

The physical properties of LNPs are tuned to tailor distribution to target organs.

- Surface charge
- Ionizable cationic lipids

Active

Targeting ligands are conjugated to the surface of LNPs. These ligands interact with their cognate receptors in target organs.



Endogenous

Certain lipid components of LNPs bind endogenous serum proteins, which interact with cognate receptors in target organs.



Uptake & Cargo Mechanisms

LNP uptake and cargo delivery is critical for the efficient transport of therapeutic cargoes into target cells. Cargoes delivered by LNPs can be used to tailor many cellular processes, making them a promising approach for many therapeutic applications.