QUATERNIZED-ZWITTERIONIC IIONIZABLE LIPIDS

Tech ID: 34664 / UC Case 2026-125-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

The central hurdle in the clinical translation of mRNA-based medicine is the inherent toxicity of the delivery vehicle. Standard Lipid Nanoparticles (LNPs) rely on cationic ionizable lipids that carry a positive charge at a pH of approximately 7.4, triggering aggressive pro-inflammatory responses and complement activation.

UC Berkeley researchers have developed a novel class of lipids engineered to resolve the "charge-toxicity" trade-off in nucleic acid delivery. Unlike conventional ionizable lipids that maintain a problematic positive charge density at physiological levels, these quaternized ionizable lipids are specifically tuned to remain neutral or negatively charged at a pH of approximately 7.4. They only transition to a positively charged state in acidic environments, such as the endosome, ensuring that the payload is released exactly where it is needed without alerting the immune system during systemic circulation.

SUGGESTED USES

- Facilitates the delivery of mRNA for protein replacement therapies or gene editing components (e.g., CRISPR/Cas9)
- Creates lower-reactogenicity vaccines for infectious diseases and oncology
- Improves the safety profile of siRNA or miRNA-based silencing treatments
- Enables repeated dosing of genetic medicines where traditional LNPs would otherwise cause cumulative toxicity

ADVANTAGES

- Reduces immunogenicity by maintaining a neutral or negative charge at physiological pH, these lipids avoid the activation of TLR4, the ESCRT pathway, the platelet factor pathway, and the complement system
- Reduces systemic toxicity compared to current clinical-standard cationic lipids, allowing for broader therapeutic windows
- Provides a pH-sensitive "switch" ensuring that the positive charge, essential for endosomal escape, is only active within the target intracellular compartment

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Small Molecule Endosomal Disruptor for Biotherapeutic Delivery
- Compositions and Methods for Identifying Functional Nucleic Acid Delivery Vehicles
- New Acid Degradable Lipids Based On Self Assembling Peptides
- Lipid Nanopartices with non-immunogenic Poly (ethylene glycol)
- Acid Degradable Solid Lipid Nanoparticles

CONTACT

Terri Sale
terri.sale@berkeley.edu
tel: 510-643-4219.

INVENTORS

- Murthy, Niren

OTHER INFORMATION

KEYWORDS

mRNA, vaccine development, gene silencing, gene editing

CATEGORIZED AS

- **Medical**
  - Delivery Systems
  - Gene Therapy
  - Research Tools
  - Therapeutics

RELATED CASES

2026-125-0

University of California, Berkeley Office of Technology Licensing
2150 Shattuck Avenue, Suite 510, Berkeley,CA 94704
Tel: 510.643.7201 | Fax: 510.642.4566
https://ipira.berkeley.edu/ | otl-feedback@lists.berkeley.edu