Photoactivatable Lipid Nanoparticles for Drug Delivery

Novel photoactivatable lipid nanoparticles for drug delivery that allow for light-triggered drug release at the disease site

Technology Overview

This invention pertains to the development of novel photoactivatable lipid nanoparticles (paLNP) for drug delivery. These paLNPs incorporate photoswitchable lipid analogs in the exterior lipid shell allowing for light-triggered drug release at the disease site. In proof-of-concept studies (*Chander et al. Small 2021*), paLNPs displayed similar size distributions, stabilities, drug loading efficiencies, and in vivo pharmacokinetics as clinically-approved parent LNP systems. Additionally, paLNPs loaded with doxorubicin demonstrated selective drug release in the presence of red light and enhanced cytotoxic effects in vitro and in vivo.

Background

Lipid nanoparticle (LNP) systems are well-established drug delivery platforms for multiple therapeutic modalities, including small molecule drugs and exogenous nucleic acids. Encapsulation of drugs in LNPs affords several advantages: ability to systemically distribute cytotoxic and/or liable drugs, enhanced accumulation at tumor sites, and a reduction in toxic side effects. One fundamental problem of LNPs, however, is the slow and unselective release of the encapsulated drug at the disease site limiting the therapeutic benefit. Therefore, LNP technologies that provide spatial and temporal control of drug release would have significant benefits for some diseases.

Benefits

- Selective drug targeting paLNPs allow for spatial and temporal control of drug release affording precise drug application at the disease site
- LNP customizability paLNPs can be readily “tuned” to release drugs in response to different wavelengths of light (including red-shifted radiation). Additionally, the rate of drug release from paLNPs can be optimized using different light intensities
- Optical control Light is a cheap, convenient, and optimizable means of modulation

Applications

Disease indications where precise drug delivery is desirable to increase the therapeutic window and avoid off-target toxicity (e.g. many types of cancer chemotherapy)

Intellectual Property

NYU has filed a U.S. non-provisional patent application covering composition and method of use.

Technology ID

TRA03-04

Category

Life Sciences/Biochemicals & Small Molecules
Life Sciences/Platform Technology
Life Sciences/Drug Delivery Systems
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References

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