LIPID-COATED POLY(LIPOIC)-LIPID HHYBRID NANOPARTICLES

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Nanomedicine has emerged as a promising field for targeted drug delivery and gene therapy, offering potential solutions to various diseases. The formation of protein corona around nanoparticles is a critical aspect that influences their biological interactions and therapeutic efficacy. Understanding the proteins that trigger immune responses upon corona formation is the key to tapping into the full therapeutic potential of nanomedicine.

We propose a novel approach to install a stealth-like cellular membrane on nanoparticles by employing lipids. Our method to make nanoparticles involves the synthesis of monomers derived from lipoic acid and their subsequent polymerization in water solution. Through this technique, we aim to create lipid-enveloped nanoparticles capable of encapsulating drugs, RNA, or plasmids while offering efficient and covert passage through the cellular membrane.

Poly(lipoic acid) derivatives prepared by RODEP (Ring Opening Disulfide Exchange Polymerization) are ideal candidates for the formulation of biodegradable nanoparticles. Lipoic acid is not only an endogenous molecule, but it also has antioxidant and anticancer properties. However, to create fully biodegradable nanoparticles, we sought to modify the coating. Therefore, we will perform a stability assessment of different lipids as DOPC, DOPG and DOTAP, used as nanoparticle coatings to determine the potential to improve the biocompatibility of the resulting nanocarrier.



Key words: Biodegradable, Lipoic Acid, Phospholipids, Biocompatible.

REFERENCES

- [1] J. W. Trzciński et al., "Poly (lipoic acid)-based nanoparticles as self-organized, biocompatible, and coronafree nanovectors", Biomacromolecules, vol. 22, no. 2, pp. 467-480, 2020.
- [2] C. Castellani et al., "Poly (lipoic acid)-based nanoparticles as a new therapeutic tool for delivering active molecules", Nanomedicine: Nanotechnology, Biology and Medicine, vol. 45, p. 102593, 2022.
- [3] L. Kliesch et al., "Lipid–Polymer Hybrid Nanoparticles for mRNA Delivery to Dendritic Cells: Impact of Lipid Composition on Performance in Different Media", Pharmaceutics, vol. 14, no. 12, p. 2675, 2022.