The 2nd Symposium on Drug Discovery

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Speaker information

General Information

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Education Background	PhD, University of Cagliari	
Professional Appointment	Associate Professor	
Research Interest	Drug delivery, liquid crystalline nanoparticles, colloidal science	

Recent Publications

1. L. Casula, G. E. Giacomazzo, L. Conti, M. Fornasier, B. Manca, M. Schlich, C. Sinico, T. Rheinberger, F. R. Wurm, C. Giorgi, S. Murgia, *Journal of Colloid and Interface Science*, 2024, 670, 234-245, DOI: 10.1016/j.jcis.2024.05.088.
2. G. E. Giacomazzo, M. Schlich, L. Casula, L. Galantini, A. Del Giudice, G. Pietraperzia, C. Sinico, F. Cencetti, S. Pecchioli, B. Valtancoli, L. Conti, S. Murgia, C. Giorgi, *Inorganic Chemistry Frontiers*, 2023, *10*, 3025-3036. DOI: 10.1039/d2qi02678c.
3. F. Damiani Victorelli, L. Salvati Manni, S. Biffi, B. Bortot, H. Harb Buzzá, V. Lutz-Bueno, S. Handschin, G. Calixto, S. Murgia, M. Chorilli, R. Mezzenga, *Journal of Colloid and Interface Science*, 2022, *620*, 419-2430. DOI: 10.1016/j.jcis.2022.04.031.
4. U. Bazylińska, D. Wawrzyńczyk, J. Kulbacka, G. Picci, L. Salvati Manni, S. Handschin, M. Fornasier, C. Caltagirone, R. Mezzenga, S. Murgia, *ACS Nano*, 2022, *16*, 5427−5438. DOI: 10.1021/acsnano.1c09367.
5. P. Naidjonoka, M. Fornasier, D. Pålsson, G. Rudolph, B. Al-Rudainy, S. Murgia, T. Nylander, *Colloids and Surfaces B*, 2021, *203*, 111753. DOI: 10.1016/j.colsurfb.2021.111753.
6. M. Fornasier, S. Biffi, B. Bortot, P. Macor, A. Manhart, F. R. Wurm, S. Murgia, *Journal of Colloid and Interface Science*, 2020, *580*, 286-297. DOI: 10.1016/j.jcis.2020.07.038.
7. S. Jenni, G. Picci, M. Fornasier, M. Mamusa, J. Schmidt, Y. Talmon, A. Sour, V. Heitz, S. Murgia, C. Caltagirone, *Photochemical & Photobiological Sciences*, 2020, *19*, 674-680. DOI: 10.1039/c9pp00449a.
8. S. Murgia, S. Biffi, R. Mezzenga, *Current Opinion in Colloid & Interface Science*, 2020, *48*, 28-39. DOI: 10.1016/j.cocis.2020.03.006.
9. U. Bazylińska, J. Kulbacka, J. Schmidt, Y. Talmon, S. Murgia, *Journal of Colloid and Interface Science*, 2018, 522, 163-173. DOI: 10.1016/j.jcis.2018.03.063.
10. S. Biffi, L. Andolfi, C. Caltagirone, C. Garrovo, A. M. Falchi, V. Lippolis, A. Lorenzon, P. Macor, V. Meli, M. Monduzzi, M. Obiols-Rabasa, L. Petrizza, L. Prodi, A. Rosa, J. Schmidt, Y. Talmon, S. Murgia, *Nanotechnology*, 2017, *28*, 055102. DOI: 10.1088/1361-6528/28/5/055102.

Speaker information

Speech Topic and Abstract

Title:
Bicontinuous cubic liquid crystalline nanoparticles for anticancer photodynamic therapy

Abstract:

Photodynamic Therapy (PDT) is an innovative cancer treatment that has been approved by the US FDA. PDT utilizes a photosensitizer (PS) molecule, which, upon activation by low-energy light, generates Reactive Oxygen Species (ROS). These ROS induce cell death, cause microvascular damage, and trigger an inflammatory response that can potentially lead to systemic immunity.

However, most photosensitizers are highly hydrophobic, necessitating their incorporation into suitable carriers for systemic administration. This also helps them evade the Mononuclear Phagocyte System.

In this study, we explore the physicochemical properties, photodynamic efficacy, and cytotoxic characteristics of lipid-based cubic liquid crystalline nanoparticles, known as cubosomes, engineered for systemic or topical PDT applications. Monoolein was used as the molecular building block to prepare various cubosome formulations loaded with commercial or newly synthesized photosensitizers. Stabilization against flocculation in aqueous solutions was achieved using Pluronics or a polyphosphoester analog of Pluronic F127. Additionally, the layer-by-layer technique was employed to coat the nanoparticle surface with folate-conjugated chitosan. We also present a polymer-free stabilized cubosome formulation.

The tested formulations exhibited the expected cytotoxicity only upon proper irradiation. In one instance, conditions were optimized to trigger the cytotoxic effect using laser radiation at a wavelength within the optical window of biological tissues. These findings establish cubosomes as a new generation of biocompatible nanoparticles with potential for a wide range of anticancer photodynamic applications.