Rodrigo Ce

Centro Universitario Avantis
Brazil

Advances in Lipid-Core Nanocapsules: From antimicrobial and antifungal applications to cancer therapy

Abstract:

Nanotechnology has revolutionized drug delivery systems, with lipid-core nanocapsules (LNCs) emerging as a promising platform for encapsulating hydrophobic and hydrophilic drugs, enhancing bioavailability, and enabling targeted therapy. This work reviews recent advances in LNCs, highlighting their applications in antimicrobial, antifungal, and anticancer therapies. Methodologies included the preparation of LNCs using lecithin, polysorbate 80, and chitosan, with active agents such as dapsone, fusidic acid, and doxorubicin. Characterization techniques like laser diffraction, dynamic light scattering, and transmission electron microscopy (TEM) were employed, alongside biological assays to evaluate efficacy. Key findings include the significant antimicrobial and antifungal activity of dapsone-loaded LNCs against multidrug-resistant Staphylococcus aureus and filamentous fungi, as well as the enhanced antibacterial performance of fusidic acid-loaded LNCs against Gram-positive bacteria. In cancer therapy, doxorubicin-folic acid-conjugated LNCs demonstrated improved cytotoxicity, apoptosis induction, and inhibition of cancer cell migration in triple-negative breast cancer. Double-functionalized LNCs also showed superior efficacy in ovarian and bladder cancer models, with improved cellular uptake and stability. Lipid-core nanocapsules (LNCs) represent a transformative advancement in drug delivery, demonstrating remarkable efficacy in antimicrobial, antifungal, and anticancer therapies. By enhancing drug bioavailability, targeting specific tissues, and overcoming resistance, LNCs hold significant promise for clinical translation and future applications in nanomedicine. Further optimization and research are essential to unlock their full therapeutic potential.

Biography

Rodrigo Ce is a researcher and educator with a degree in Biomedicine, as well as a Masters and Ph.D. in Pharmaceutical Sciences from the Federal University of Rio Grande do Sul (UFRGS), where he received a Vote of Praise for his doctoral accomplishments. Specializing in nanostructured systems, particularly lipid-core nanocapsules, he currently serves as the Teaching Manager and Professor of the Biomedicine program at Centro Universitario Avantis Uniavan, and as Coordinator of the Postgraduate Program in Clinical Analysis and Laboratory Diagnostics. Dr. Ce is also a member of the editorial board for several scientific journals.