Category: Research

Development of Surface Modified Mesoporous Silica Nanoparticles for Co-delivery of Resveratrol and Tamoxifen Citrate for localized breast cancer therapy

Introduction:

Breast cancer stands as the most prevalent cancer among women on a global scale. Endocrine therapy is one of the efficient treatment options that is challenged by the low oral bioavailability and off-target accumulation of tamoxifen citrate an estrogen receptor modulator commonly used. The established evidence of synergistic anti-cancer activity of the resveratrol and tamoxifen citrate seeks attention to alternative platforms to improve the oral bioavailability and targeting to the required site of action.

Method:

Though several established approaches to improve targeting and enhance bioavailability are available, Mesoporous Silica Nanoparticles (MSNs) a nanoplatform has been the choice for this study. Owing to its suitability of co-loading multiple drugs and its ability to encapsulate large amounts of drugs, it is considered a versatile nanocarrier. The targeting ability of the MSNs was further enhanced by surface conjugation with specific ligands that facilitate preferential tumor cell uptake.

Results and Discussion:

Folate conjugation was performed by post-grafting amine functionalization via EDC-NHS chemistry, once the MSNs were synthesized using modified stober's method. The F-MSNs loaded with drugs by the rotavap method were shown to display successful entrapment within the mesopores of the silica nanoparticles when characterized by DSC and FTIR. The in vitro drug release was better in pH 5.5 of the tumor microenvironment as compared to pH 7.4 of blood.

Conclusion:

Breast cancer remains a significant health concern, due to its uneven progress and persisting disparities. Continued efforts are needed to improve early detection and access to quality treatment. The controlled drug release in basic pH as compared to the acidic pH gives us an idea about the tumor-targeting ability of the developed nanoformulation. A detailed efficacy study could further potentiate the application of these nanoformulation upon establishing the safety and efficacy profile.