Folate Complex and pH-Responsive SPIONs/MCF as a Novel Delivery System to Improve Tamoxifen's Selectivity and Toxicity Impact

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Breast cancer is the most prevalent type of cancer in women. 31.4% new breast cancer cases in Saudi females were diagnosed in 2020, and more than 2.26 million new case globally. Tamoxifen (TAM) is one of the most commonly used drugs for breast cancer treatment. However, it exhibits side effects, prevalent in 73% of female users. This research aims to improve tamoxifen selectivity and reduce toxicity by using magnetic/silica/folate nanoformulation. Multifunctional nano drug delivery system, with optimal drug release behavior utilizing folate complex along with a prognostic imaging tool, will be an ideal targeted therapy tool for treating breast cancer. A SPIONs/ Silica foam/folate sample was used for TAM adsorption at different time intervals (0.25-48 h) and drug delivery was studied using a dialysis membrane technique with different variables. The efficiency of the drug was measured using UV-visible spectroscopy. The nanoformulation was characterized using different physico-chemical techniques, such as XRD, BET and TEM. The SPIONs/foam nanocarrier has a surface area of 507 m^2/g, a pore volume of 1.26 cm^3/g, and a pore size of 10 nm. A systematic drug adsorption was observed with 99.97% entrapment efficiency in 48h. The drug release showed that TAM exhibits a passive release profile suitable for breast cancer therapy. These results display a promising aspect to treat cancer cells and reduce toxicity to normal cells. This may reduce the suffering of patients and improve their mental state and strength in fighting the disease.

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