Development of Monodispersed Hollow Silica Nanospheres Loaded with 5-Fluorouracil to Enhance the Drug Delivery on Breast Cancer Cell Line MCF-7

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Statistical reports have shown that 627,000 women worldwide died from breast cancer in 2018. There are many useful drugs available today. However, the obstacles in cancer chemotherapy are the ability to distinguish between normal and cancerous cells and low drug accumulation inside tumor tissue leading to unwanted side effects and high dose injections. The major challenge is to synthesize a drug carrier that can deliver the drug to the precise tumor and release it to the organ without harming other cells with minimum side effects and much simpler method with low-cost preparation. In this study, monodispersed hollow silica nanospheres have been prepared using sol gel process. 5-Fluorouracil, conjugated with chitosan, was successfully loaded into hollow silica nanospheres. The anticancer activity of 5-Fluorouracil and 5-Fluorouracil loaded in silica was evaluated against MCF-7, breast cancer cell line. Cells were seeded on a 96-well plate (10,000 cells/well) and drug loaded in silica and free drug with different concentration were added. Results show that the free drug has a cell viability of up to 60% while drug loaded in silica which enhanced the anticancer activity had a cell viability down to 30%. Therefore, this indicated that drug loaded in silica showed higher anticancer activity as compared with free drug. It further suggests that hollow silica nanospheres are useful for the delivery of 5-Fluorouracil by loading the silica with the drug. And it may also be used for delivery of other therapeutics and biological molecules.

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