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Mesoporous silica nanoparticles facilitated delivery of melphalan HCl for treatment of breast cancer

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Breast cancer remains the second most common cause of cancer death in women. Eighty per cent of women diagnosed are alive at five years. Melphalan hydrochloride (MH) an antineoplastic in the class of alkylating agents and is used to treat multiple myeloma, ovarian cancer, breast cancer. The major drawback of MH is its solubility, degradation at physiological pH and short circulation half-life. The present study was aimed to carry out the development and characterization of MH loaded mesoporous silica nanoparticles (MSNs). The structural characterization of MSNs was done with TEM, SEM, XRD, DSC, FTIR, TGA and BET analysis. The *in vitro* drug release and *in vitro* cytotoxicity was also determined. The MSNs were synthesized by reaction between TEOS and CTAB. The TEM result revealed that MSN are hexagonal with honeycomb pattern arrangement of the channels and all samples were of regular shapes. SEM results revealed that most of the MSNs particles were around 100nm. Pore size of MSNs was 2nm and followed type IV isotherm pattern confirmed by BET analysis. The drug loading was carried out using rotavapor method and 78% drug loading was obtained for 1:9 ratio of drug and carrier. The Mel-MSN showed 94.81% drug release as compared to Mel-MSN-NH2 (61.07%) and pure drug (46.89%) after 3 hrs. The *in vitro* cytotoxicty of Mel-MSN showed 89.16 % inhibition as compared to pure drug (63.42%) on MCF7 cell line by MTT assay. The short term stability study revealed stable behavior of melphalan loaded MSN.