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# Surface engineered mesoporous silica nanoparticles as drug delivery carrier for bioactive compounds

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Engineered nanomaterials carry significant promise to improve disease diagnosis and treatment specificity. Nanotechnology could help overcome the limitations of conventional systems, as biodistribution to intracellular trafficking, through cell-specific targeting, molecular transport to specific organelles, and other approaches. NPS has the potential to improve the stability and solubility of encapsulated cargos, promote transport across membranes and prolong circulation times to increase safety and efficacy. For these reasons, NP research has been widespread, generating promising results in vitro. Surface modification has a strong impact on Mesoporous silica nanoparticles (MSNs) performance as drug carriers. Here, we described the chemical synthesis, in vitro drug release, the pharmacological activity of decorated MSNs. Surface engineering was carried out using Poly (ethylene glycol) as well as poly (propylene glycol) as an outer shell wrap for nanoparticles (NPS). In addition to lactose; folic acid and hayalorinc acid as molecules with specific receptors expressed on some cells' surfaces. Fourier transform infrared spectroscopy (FTIR) and Transmission Electron Microscopy (TEM) confirmed successful chemical surface modification while Dynamic Light Scattering (DLS) confirmed the surface character change as size; polydispersity index (PI) as well as zeta potential. Decorated MSNs loaded with different bioactive materials such as Doxorubicin and plant extracts have been evaluated for their bioactivities using suitable in vitro assays. PI has improved while the size has enlarged. Drug entrapment of functionalized nanoparticles demonstrates a higher percentage than plain MSNs. This study may provide an approach for designing and improving the applicability of MSNs as a drug delivery system in various approaches.

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