Dexamethasone loaded mesoporous silica nanoparticles for sustained anti-inflammatory effects in rheumatoid arthritis

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The design of smart and in-vivo applicable nanocarrier for drug delivery systems has led to the development of nanomedicine with improved therapeutic efficiency. In this study, high-capacity loading efficiency and sustained release of drugs were achieved through radially oriented mesopores and surface functions using mesoporous silica nanoparticles as a drug carrier. The delivery of dexamethasone was chosen to test this delivery system for lasting anti-inflammatory effects in rheumatoid arthritis and the treatment focuses on inhibiting inflammation. A drug loading efficiency of ca. 73 wt% was achieved, which is 2 times more than other silica nanoparticles such as SBA-15. In addition, pH-dependent release of dexamethasone was achieved, thus, more sustained release profile at pH 7.4 was evaluated for 100 h in vitro. Finally, when the nanomedicine applies to in vivo RA disease animal model, there were significant anti-inflammatory effects over time compared to the control groups. The results indicate that in vivo drug concentrations and effects can be sustained by nanocarriers, which should allow it to be applied in drug delivery nanosystem.