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Synthesis and characterization of mesoporous SiO₂ nanoparticles functionalized with folic acid and loaded with temozolomide as drug delivery system for glioblastoma cancer

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Glioblastoma multiforme is known as the most frequent and deadly primary brain tumor. The clinical treatment for patients is surgery followed by radio and chemotherapies. Temozolomide is a DNA alkylating agent used as a first-line prodrug administered orally or intravenously to treat patients with glioblastoma. An alternative approach to improve the treatment of gliomas is the applications of nanomaterials with specific surface modification. Mesoporous silica nanoparticles have emerged as tools for their use as drug delivery nanocarriers, due to the porous structure of silica with hundreds of empty cavities for hosts of a large amounts of drug. The MSiO₂ nanoparticles functionalized with folic acid and loaded with temozolomide, were obtained by synthesis with Stober method. The isotherm corresponds to and a uniform mesoporous structure, the BET surface area was 1092 m²/g, the pore volume of 1.120 cc/g, and the average pore size of 4.10 nm. A well-defined dimensional hexagonal structure and an average diameter of 70 nm were observed by HR-TEM. The temozolomide release profile shows two steps, first about 10 % of temozolomide was quickly released, and a second, a sustained release of 15 % was observed at 8h. Higuchi's model better describe the release of the drug from the insoluble matrix as a square root of a time-dependent process based on Fickian diffusion. Mesoporous silica nanoparticles offer new properties such as targeted delivery, controlled release, improved bioavailability, and cellular uptake. Further the functionalization with folic acid can to differentiate between cancer and healthy cells.

Biography

Citlali Ekaterina Rodríguez-Pérez has completed his PhD in Biomedical Sciences from National Autonomous University of Mexico (UNAM) and postdoctoral studies in cell signaling from David Geffen School of Medicine at University of California, Los Angeles (UCLA). Actually, she is a Researcher at National Institute of Neurology and Neurosurgery (INNN) in Mexico city (Mexico), working in the laboratory of molecular Neuropharmacology and Nanotechnology.

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