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Upconversion nanoparticles loaded with anticancer drugs for solid tumor theranostics: Reverse microemulsion preparation and characterization

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The upconversion nanoparticles (UCNPs) that give anti-Stokes luminescence emission are considered as potential biomarkers for biotissue visualization in near infrared range (NIR). UCNPs are less toxic compared to organic fluorophores and quantum dots, and possess stable narrow-band emission when excited with NIR laser. Here, we propose high quantum yielding core-shell structured NaYF4:Er,Yb, ErTm UCNP anti-Stokes nanophosphors as a platform for tumor theranostic. For this purpose, we synthesize oleate stabilized NaYF4/NaYF4:YbEr and NaYF4/NaYF4:YbTm core-shell structured UCNPs by microemulsion technique that expected to provide high drug entrapment efficiency with long-term stability. Undoped NaYF4 serve as inner-core structure while lanthanide doped NaYF4 act as outer-shell. Then, it is to be functionalized with PLGA polymer by ligand exchange reaction. To achieve therapeutic effect, the UCNP-PLGA are loaded with antitumor drugs such as doxorubicin (DOX) and nanocurcumin (NANOCUR). The hybrid DOX and NANOCUR drug therapy with the core-shell UCNP can promote synergistic action for anti-cancer applications. Moreover, both DOX and NANOCUR are fluorescent drugs, so their distribution and accumulation could be evaluated using routine laboratory techniques, including confocal fluorescent microscopy and flow cytometry. To the best of our knowledge, this is first time of designing a hybrid organic-natural drug nano-container of model DOX-NANOCUR-PLGA-UCNP for cancer theranostic applications.

Biography

Roman AKASOV has completed his PhD in Biotechnology by Strasbourg University. Currently, he is a research fellow at Sechenov First Moscow State Medical University (Sechenov University). He has published 12 papers in reputed journals in the field of 3D cell culture, cancer research, drug delivery, and nanoparticles design."

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