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New simple way to obtain aqueous fullerene nanodispersions for biomedical applications

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It is known that fullerene C_{60} and its derivatives have various biological activities including antioxidant, antibacterial, antiviral and some others. But the biggest problem is the complete insolubility of fullerenes in aqueous media. Different techniques to solubilize C_{60} have been proposed since 1994; however, most of these are time-consuming and requires the use of toxic solvents and sonication. In this work, a remarkably simple procedure to prepare stabile clear aqueous fullerene C_{60} solution (nC_{60}) is suggested. The fullerene C_{60} aqueous solutions (nC_{60}) were prepared by simply mixing the C_{60} solution in N-methylpyrrolidone (NMP) with de-ionized water followed by exhaustive dialysis against distilled water. Additionally, low-molecular weight, natural substance (L-amino acids, monosaccharides and glycerol) were used as stabilizing agents. The conversion of C_{60} from the crystalline state to the solution $nC_{60}$was almost quantitative and one can obtain relatively high concentrations of C_{60}, up to 1 mg/ml, with particle sizes about 100 nm. Their UV-Vis spectra as well as FTIR spectra are characteristic of the species described in the literature previously. The mechanism of formation of aqueous fullerene nano dispersions is still unknown; one can assume that there is a formation ofcharge-transfer complex between C_{60} and NMP molecules together with partial hydroxylation of C_{60} nanoparticles. The obtained C_{60} nanodispersions were stable at least 10-12 months at 8-10°C. The proposed method is promising for the preparation of solutions endo fullerenes, and probably for solubilization of higher fullerenes. The samples of nC_{60} showed anti-inflammatory activity in mouse models of allergy and atopic dermatitis.

Biography

Purgina D D graduated from I M Sechenov First Moscow State Medical University in 2013. Currently, she is working at the NRC Institute of Immunology in the Department of Nanobiomedical Technology. She has participated in international conferences on nanotechnology and immunology. She is currently working on her PhD thesis.

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Synthesis and characterization of block copolymer encapsulated silver nanoparticles

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Nanoparticles are typically smaller than several hundred nanometers in size, comparable to large biological molecules such as enzymes, receptors, and antibodies. With the size of about one hundred to ten thousand times smaller than human cells, these nanoparticles can offer unprecedented interactions with biomolecules both on the surface of and inside the cells, which may revolutionize cancer diagnosis and treatment. The most well-studied nanoparticles include quantum dots, carbon nanotubes, paramagnetic nanoparticles, liposomes, gold nanoparticles, and many otherAmphiphilic block copolymers (BCPs) can self-assemble into various nanostructures such as spherical/cylindrical micelles, lamella phases, or vesicle membranes depending on block ratio of the BCPs, solubility of the blocks in the solvents, solvent composition/concentration, immiscibility of the solvents, and temperature/pH of the solutions. These predictable BCP aggregates have attracted considerable interest not only for academic reasons, but also because of potential applications in the fields of medicine, biology, electronics, and catalysis. We have synthesized a novel triblock copolymer via ATRP, having poly (dimethyl amino) ethyl methacrylate group, which is further used for micelle formation containing silver nanoparticles. ^{1}H NMR, ^{13}C NMR, XRD, FESEM, HRTEM were used for characterization of our material.

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