

Protein Microspheres with Unique Autofluorescence for Non-invasively Tracking and Modelling of Their In Vivo Biodegradation

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Abstract

Spray-dried bovine serum albumin (BSA) microspheres were prepared through a facile and low-cost route. Interestingly the as-prepared BSA microspheres possess unique blue-green, green, green-yellow, and red fluorescence when excited by specific wavelengths of laser or LED light. The studies of UV-visible reflectance spectra and fluorescence emission spectra indicated that four classes of fluorescent compounds are presumably formed during the fabrication processes. The formation and the potential contributors for the unique autofluorescence were also discussed and proposed. Good in vitro and in vivo biocompatibility was confirmed by the cytotoxicity test on the A549 cancer cells and tissue histological analysis, respectively. Potential applications of the autofluorescent BSA microspheres were first demonstrated as a novel tracer for convenient tracking/modelling of the biodegradation of injected autofluorescent BSA microspheres in mouse model based on non-invasive, time-dependent fluorescence images of the mice, in which experimental data are in good agreement with the proposed diffusive model. All these studies indicate that the as-developed protein microspheres exhibiting good biocompatibility, biodegradability, and unique autofluorescence, can significantly broaden biomedical applications of protein fluorescent particles.