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ENGINEERED POROUS SCAFFOLDS FOR NANOMEDICINE SCREENING

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SUMMARY

Biomedical nanotechnology has attracted a wide range of nanomaterials for their potential application in cancer diagnosis and treatment. Our recent report on development of organosilane functionalized nanoparticles of cerium oxide (functionalized nanoceria) has shown a great promise for future nanomedicine. In vitro screening of emerging nanomedicine relies on cytotoxic assays on established cancer cell lines grown on an appropriate tumor model mimicking the original complexity and heterogeneity of a clinical tumor. Here-in, aqueous dispersible functionalized nanoceria were prepared via our established biocompatible synthetic procedure and re-functionalized using biopolymer (atelocollagen). The collagen functionalized nanoceria was used for surface modification of PLGA porous scaffolds prepared via freeze-drying method (using ice microporogen). Human breast cancer cells (MCF-7) were cultured over porous scaffolds for using them as in vitro tumor models. The therapeutic efficacy of functionalized nanoceria was evaluated as an index of its cytotoxicity towards the seeded MCF cells. The results indicated surface modified porous scaffolds demonstrated reduced cell viability and proliferation of cancerous cells. Moreover, the cytotoxic impact of the functionalized nanoceria was higher than that of the pristine nanoceria.. The enhanced cellular uptake aided by the excellent aqueous dispersibility of organosilane functionalized nanoceria could be the plausible mechanism behind the elevated cytotoxicity. In addition, redox nature of nanoceria assists in intracellular ROS production in MCF cells, detrimental to cancer metastases. The modified porous scaffolds can be used as in vitro tumor models for therapeutic evaluation of cancer nanomedicine-functionalized nanoceria. Moreover, the new generation porous scaffolds open promising prospects for tissue replacement in reconstructive surgery.