



Colloidal stabilized lanthanum strontium manganese oxide (LSMO) by encapsulating mesoporous silica shell for cancer treatment via magnetic hyperthermia: an in vitro study

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Abstract:

In magnetic hyperthermia therapy (MHT), the heat generated from magnetic nanoparticles (in the range of 41°-44°C) at the target tumor site under the exposure of alternating magnetic field[1]. Various studies have been achieved the desired therapeutic heat at the target tumor site by using higher dose of magnetic nanoparticles (MNPs)[2]. However, high dose of MNPs exhibited toxic effects on surrounding healthy cells. Therefore, a critical challenge is to achieve the desired temperature at a lower dose of MNPs to avoid toxic effects on healthy tissues. The desired temperature at a lower dose of MNPs could be achieved by improving its heating efficiency. In this study, the mesoporous silica encapsulation on LSMO were used as a strategy for the enhancement of heating efficiency of LSMO at a lower dose limit (Fig. a)[3]. We demonstrated that mesoporous silica coating on LSMO (MSLN) enhances the colloidal stability, biocompatibility (Fig. c) and heating efficiency. The heating efficiency of MSLN, represented as specific absorption rate, was 240W/g at 335 kHz frequency and 14 KA/m applied field. MHT resulted in 80% cancer cell death (A549) at 43°C within 45 min, as validated by MTT (Fig. d). The cell death pathway revealed that apoptosis is the main mode of cell death at 43°C, as validated using flow cytometry. These conclusions may offer the future standpoint for in-vivo use of MSLN in MHT, either as a single entity or in combination with chemotherapy. In Vivo studies



are currently ongoing animal model to elucidate the same mechanism under physiological conditions.

Biography:

Ravi Kumar has completed his M.Sc. Electronic Science from Department of Electronic Science, University of Delhi, India. Currently, he is pursuing Ph.D. in Special center from Nanoscience, Jawaharlal Nehru University, India. His area of research is 'synthesis of smart magnetic materials for biomedical and sensing application. He has published 4 papers in reputed journals.

Recent Publications:

1. Kumar R, et al;J Clin Transl Hepatol,2020 Kumar R, et al;Lancet Haematol,2019
2. Kumar R, et al;Lancet,2017
3. Kumar R, et al;Lancet Diabetes Endocrinol,2017
4. Kumar R, et al;N Engl J Med, 2014

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