20th World Congress on
RADIOLOGY AND ONCOLOGY
September 26-27, 2018 | Chicago, USA

Localized cancer treatment by magnetic hyperthermia using magnetic nanoparticles

Bijoy Kumar Kuanr, Anjali and **Ravi Kumar**
Jawaharlal Nehru University, India

Cancer is one of the biggest curses on humanity, causes almost 8.2 million deaths annually. In past decades, many conventional therapies including radiation therapy, chemotherapy, and surgery have been employed for the treatment of cancer. Besides the various side effects of these conventional therapies, the reoccurrence of the cancer is often a major issue. Therefore, efforts have been made to eradicate these long-standing obstacles. Magnetic hyperthermia (MHT) is an alternative non-invasive approach, considered as an effective technique for cancer treatment without any adverse effects on surrounding cells. MHT technique involves the generation of heat in the range of 41^{O}C to 45^{O}C to targeted area loaded with magnetic nanoparticles (MNPs), on exposure to an alternating magnetic field (AMF). As cancer cells are more susceptible to hyperthermic temperatures, efficient and specific targeting of magnetic nanoparticles may provide enhanced heating precisely in tumors cells. Various reports on *in vivo* studies demonstrated that MNPs with Curie temperature (Tc) having a therapeutic temperature range of 42^{O}C to 50^{O}C is more suitable. It has been reported that heat generation during hyperthermia increases the drug efficacy or release of chemotherapeutic drugs. Another study demonstrated magnetic hyperthermia-based therapy might be able to induce an anti-cancer immunological response. Notably, the combination of chemotherapy with magnetic hyperthermia induces synergistic therapeutic effect for effective cancer treatment. However, the critical issue is the fabrication of multifunctional platform which can treat cancer using MHT therapy. To achieve targeted therapeutic temperature with the minimal dosage of administered MNPs, there is a necessity for the development of MNPs which revealed the high specific absorption rate (SAR) with high colloidal stability and low cytotoxicity. Here, in this study, our specific aim is to enhance the heating efficiency of nanoparticles. In addition, we demonstrate the therapeutic potential of synthesized nanoparticles using Magnetic Hyperthermia. We observed cancer cell ablation at three different temperatures as 41^{O}C, 42^{O}C, and 43^{O}C for three different time intervals 30, 45, and 60 mins. Here, maximum 80.5 % cell death has been observed at 43OC for 60 mins under AMF exposure. Thus, the developed nanoparticles have potential in the efficient treatment of cancer cells.

Biography

Bijoy Kumar Kuanr received the PhD degree in Electronic (1993). He has more than 20 years of research experience in India as well as in various laboratories in Germany and USA. From 1994-96, he joined the Microwave Laboratory of Professor Dr. Guther Nimtz at University of Koeln, Germany as a Post-Doctoral Researcher. From 1999-2001 he worked with Professor Dr. Peter Grunberg (Nobel L aureate - Physics 2007) as a guest scientist in GMR-Sensor project. In 2002 he joined University of Colorado at Colorado Springs as a senior Researcher till 2013. His main research deals with electromagnetic theory and measurement techniques applied to materials, devices, and circuits at microwave, millimeter-wave.

bkkuanr@gmail.com

Notes: