

The use of iron oxide nanoparticles in hyperthermia of Ehrlich tumor

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Background: Nanotechnology offers important new tools expected to have a great impact on many areas in medical technology. It provides extraordinary opportunities to improve materials and medical devices and they contain several chemical, physical, engineering and biological sciences. Magnetic hyperthermia is a relatively new method used for cancer therapy. Magnetic nanoparticles are an attractive option because they can be remotely targeted by application of external magnetic field gradients or other active and passive targeting methods. **Aim:** Given that tumor cells are more sensitive to a temperature increase than healthy ones, this property can be used in vivo to increase the temperature of tumor tissue (40-43°C) to destroy the pathological cells by hyperthermia. **Materials and Methods:** It was found that, magnetic fluid based on superparamagnetic Fe₃O₄ nanoparticles coated by biocompatible layer is suitable for hyperthermia because the particles have a high magnetic moment, strong magnetic specific loss power (SLP) and non-toxicity. **Results:** This study presents results of research on preparing the magnetic fluid based on Fe₃O₄ nanoparticles by co-precipitation method and its potential hyperthermia application. The magnetic fluid was used as a mediator for heating by Neel relaxation when exposed to ultrasound and / or microwave energy. The magnetic fluid hyperthermia (MFH) results caused a significant anti-tumor effect on cancer cells. Ultrastructural changes were evaluated by (TEM). **Conclusion:** These results indicate that intra-tumoral injection of monodisperse MNPs can attenuate the tumor cells after exposure to ultrasound energy followed by microwave energy.

Keywords: Heating effect; Heating mechanism; Magnetic fluid hyperthermia; Magnetic nanoparticles; Ultrasound and Microwave energy

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