

THE STUDY OF THE EFFECTS OF NANOMATERIALS ON HUMAN TUMOR CELLS UNDER ULTRASOUND FIELD EXPOSURE

BERNARD Vladan, KALUŽOVÁ Adéla, MORNSTEIN Vojtěch

Masaryk University, Brno, Czech Republic, EU

Abstract

Questions related to the safety of nanoparticles within the meaning of contamination of the human body are often discussed. The possibility of using of nanoparticles as a treatment of cancer is mentioned even more often. With regard to the essence of biophysical mechanisms of action of the ultrasonic field in the cell tissue (such as changes in cell membranes, cavitation phenomena or microstreaming) can man ask: What is the effect of simultaneous application of ultrasonic field and metallic nanoparticles? Would it be possible to use this synergism for targeted therapy? The aim of the experiments was to study the viability of tumor cell line after application of an ultrasonic field in the presence of metallic nanoparticles in vitro. Effects of different nanoparticles were compared. The human ovarian carcinoma cells were affected by ultrasonic field with maximum intensity of 2 Wcm⁻², metallic nanoparticles (Ag, CU, Zn, AgCu, TiO₂) <100 nm were present in the cultivation media. Viability of affected cells was evaluated by MTT. The results show a visible decreasing effect on the viability of the tumor cells after application of metallic nanoparticles alone, as well as after application of ultrasound field at high intensities. Different nanoparticles showed different affecting of cells viability. The simultaneous action of ultrasound and nanoparticles leads to summation of effects; the experimental results show a change in cell viability, when compared to separate application of ultrasonic field and nanoparticles. Application of suitable ultrasound intensities may reduce viability of tumor cells that are cultured in the medium containing appropriate metallic nanoparticles. This effect could possibly be used for targeted therapy.

Keywords: Nanoparticle, ultrasound, viability

ACKNOWLEDGEMENTS

This project was supported by grant GACR 13-04408P

Author did not supply full text of the paper/poster.