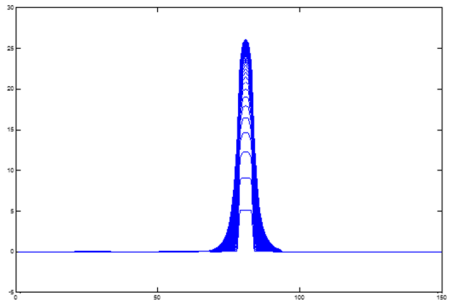
Temperature Rise during mNP Hyperthermia Therapy

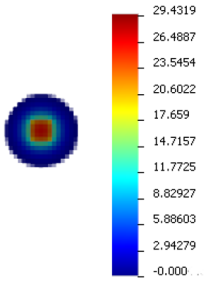
L.Shoshiashvili, A.Lomia, D.Kakulia, G.Chaganava, B.Baratashvili

Email: levan.shoshiashvili@tsu.ge
Electrical and Electronics Engineering Department,
Faculty of Exact and Natural Science,
TSU, I.Chavchavadze Ave.№3, 0179

Using magnetic Nano Particles (mNP) is a the most promising technology in cancer local hyperthermia treatment. In this article we have investigated temperature rise in Brest cancer during local hyperthermia treatment for different dosage of mNP in Brest tumor area, for 2mm realistic female model. It is shown, that temperature rise is localized in tumor area. Tumor is modeled as 1cm cube. Tumor density is taken as 20% more than healthy tissue. Ambient temperature is set T_a= 22^oC, and we have convective boundary condition between Skin and Air. Temperature rise is calculated during 30min, what is common in hyperthermia treatment.



1.a Temperature rise across X line on the level of tumor center during different times



1.b Temperature rise in tumor area $r = 1.5$ъд

Figure 1: temperature rise for 5mg mNP in tumor area for 30min exposure.

References

[1] A.Christ, W.Kainz, et al. The Virtual Family—development of surface-based anatomical models of two adults and two children for dosimetric simulations, Phys. Med. Biol. 55 N23,2010 ;
http://www.itis.ethz.ch/virtual-population/tissue-properties/database/
[2] A. L. Edwards "A compilation of Thermal Property Data for computer Heat conduction Calculations" UCRL-50569 University of California Lawrence Radiation Laboratory,(2000).