

Are we able igniting natural processes to kill cancer cells?

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Background: Long-time living ancient paradigm is eliminating the tumor cells by drastic, artificial effects (resection and necrosis) in the actual lesions. Original idea of the very first interventions in oncology had favored the necrosis by elevated temperatures in the local area. The original hyperthermia (HT) concept used the consequences of the definite high temperature in the tissue and in the physiology reactions. Oncothermia method (OTM) is a modern heir of this ancient thinking. However it changed the paradigm, emphasized more the natural physiological and biophysical-chemical processes instead of the temperature which anyway has many complications in local applications. OTM uses well-controlled modulated radiofrequency (RF) current-flow through the target tumor [1]. Temperature dosing has problems on the control and the selection of the malignancy [2], so OTM definitely uses special non-temperature dependent effects [3] avoid the normal temperature spreading promoting undesired blood-flow by the time, as well as selectively and effectively acting to eliminate the tumor [4]. OTM applies electric field to modify the natural processes, which is a well-established research area, [5]. Our present article summarizes the possible explanations of the natural OTM mechanisms, focusing on the way to proof the actual hypotheses.

Method: We performed various experiments studying the natural factors of the cell-distortion effects by OTM. A highly specialized experimental setup (EHY110, Oncotherm, Germany) was used for in-vitro and in-vivo experiments, having single shot treatments in every cases. Effects were studied histomorphologically (HM) and immunohistochemically (IHCH) by various antibodies with digital microscopy system (MiraxView, 3D Histech).

Results: Experiments show a definite time delay of tumor-destruction. The effect of OTM immediately after single shot is weak by both the HM and IHCH experiments. However, the elapsed time shows accelerated development of the cell-killing. This not immediate effect suggests the action of natural processes, which we measured. Reestablishing the adherent connections (E-cadherin) and its signal pathways (beta-catenin, p120 catenin) can be measured by IHCH, and cells start to shrink (instead of swelling expected by necrosis). Appear a definitely enhanced expression of p53 protein. After longer time in vivo (4-24 h) observable the expression of connexins (gap-junctions), and nuclear relocalization of beta-catenin starts, which is finished after 72 hours of the treatment. During this development apoptotic bodies could be observed.

Conclusion: OTM probable ignites natural apoptotic processes selectively in the tumor. Further in vivo and in silico experiments are in progress.

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