Does the success of hyperthermia depend on the heating-method?

Andras Szasz[1]
(1) Department of Biotechnics, St. Istvan University, Godollo, Hungary

Background: Oncothermia has a quarter-century history [1]. It was started by typical invasive solution (ECT, electro-cancer-therapy) and tried also invasive interstitial technology; even systemic heating was also in the production range. However, the non-invasive loco-regional (EHY2000 series) and the multilocal (EHY3000 series) products, together with the intraluminar application (EHY1000 series) became popular among professionals. Why has Oncotherm tried so many forms of synergy of electric and thermal effects? Because it had historically the same frustration as hyperthermia had in general with the start of A d'Arsonval through W. Coley or HI. Robins to H. LeVeen. My objective is to discuss the challenges and show the possible solutions of present status of oncological hyperthermia.

Method: Hyperthermia is traditionally an overheating of the tissue. Its definition has a huge variety in the medical literature. The varieties of the definitions are uniform in the 'higher as usual temperature', but is very much different in their localization ranging from the cellular level to the whole body (WBH). There are various concepts to heat-up the tumor with different approaches to follow the effects. The model systems and the clinical applications differ completely. The model systems are mostly treated by monotherapies while the medical practice uses complementary hyperthermia. The models try to investigate mainly molecular mechanisms of hyperthermia, while the clinical applications are connected to physiological reactions like drug-delivery or oxygenation.

Discussion: The difference between the medicine and poison is only the dose. In hyperthermia this is a real challenge. The dose has to be in strict correlation with the desired results, and has to be limited by safety issues; in local heating the surface blistering, while in WBH the 42C. However, the definition of the 'results' is complicated. In monotherapy the result could be the necrosis, (CEM·unit, in-vitro calibration). However, dose has to consider the physiologic factors and immune-stimulations. In modern hyperthermia applications the immune-effects have central role. This prefers 'mild temperature', because the upper limit of immune-activity is 39·40C. The immune effects are connected to electromagnetic effects, and their conjunction with complementary applications [2].

Conclusion: Effects of various heating methods are certainly different even at the same steady-state temperature. References[1] Szasz A, et al. (2010) Oncothermia: Principles and Practices, Springer, Heidelberg[2] Szasz A (2013) Challenges and solutions in oncolqgical hyperthermia, Thermal Med, 29(1):1-23