

IN VITRO AND IN VIVO COMPARISON OF HEATING METHODS

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Introduction, objectives

Classical oncological hyperthermia is often characterized solely by the homogeneous temperature increase within the tumor. Our objective is to study the effect of the heating method in vitro and in vivo at fixed temperature (42°C).

Method

We have studied the effect of hyperthermia on various cell-lines in vitro HL60 (human leukaemia all line /suspension/), HepG2 (human hepatocellular carcinoma), A431 (human epidermoid carcinoma), with human fibroblast co-culture and xenograft models HT29 (human colonctal carcinoma) and A431 on nude mice (BalbC nu/nu) in vivo. The temperature was kept on 42 (± 0.5) °C, measured by fluorescent optical-cable temperature sensors (Luxtron). The classical hyperthermic heating was in water-bath for the cell-cultures (HL60, HepG2, A431) and by infrared radiation for the invivo experiments. The other heating was made by electro-hyperthermia (oncothermia) arrangement, with a laboratory device especially developed for the experimental purposes (Oncotherm). The cell-counting was done by hoemocytometer (Burker-chamber). The immunohistochemical reactions were carried out by a fluorescent method using anti- β -catenin (Zymed), anti-p120-catenin (Sigma) and anti-E-cadherin (Zymed). The secondary antibodies were Alexa594 and Alexa488, labelled anti-mouse-IgG. The samples were imaged by confocal microscope (Bio-Rad).

Results

We had observed definite lower cell-count in the culture treated by oncothermia compared to its classically heated counterpart in the case of HL60 cell-culture. The adherent connections (beta- and p120-catenins, as well as the E-cadherin) also significantly differ by the treatment procedures, the adherent activity is higher after oncothermia than after the classical hyperthermia. The time-relaxing of the samples also has definite differences. In A431 cell line co-cultured with fibroblast, the same results were shown – regarding the distribution changes in β -atenin and E-adherin – as in the experiments described above. In vivo, the oncothermia tumor treatment is observed to be more effective in destroying the tumor structure than its classical counterpart.

Conclusions

Our present observations show definite differences between the heating procedures by hyperthermia keeping the same temperature. These measurements address questions of the underlying mechanism of hyperthermia, and make it feasible to continue the investigations in this direction.