

High Energy Shock Waves and 5-aminolevulinic acid: effects on a rat colon cancer cell line

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Device and producing company:

Piezuson 100, Wolf

Introduction:

In a previous study we demonstrated the ability of high energy shock waves (HESW), generated by a piezoelectric device, to activate natural porphyrin precursor 5-aminolevulinic acid (ALA), the most common photodynamic sensitizer, on a human colon cancer cell line, HT-29. Therefore, in order to progress our investigation to a syngeneic model of colon cancer, first we studied in vitro the cytotoxic effect of the combination of ALA and HESW, on DHD/K12/TRb rat colon cancer cells.

Methods:

Cytotoxicity was investigated by cell growth curves. DHD/K12/TRb cells were exposed to ALA (50 microg/ml) for 24 h and then to HESW treatment (E1, EFD = 0.22 mJ/mm², 1,000 impulses; and E2, EFD = 0.88 mJ/mm², 500 impulses), and viable cell growth was determined by trypan blue dye exclusion assay at days 1, 3 and 7 after HESW treatment. Cell death was investigated by flow cytometry analysis. DHD/K12/TRb cells were exposed to ALA (50 microg/ml) for 24 h and then to HESW treatment (E1 and E2), and stained with annexin-V-fluorescein (A-V-FITC)/propidium iodide (PI) at 24 h after HESW treatment. Viable cells were defined to be A-V-FITC and PI negative.

Results:

ALA exposed to HESW resulted in a significant reduction of in vitro cancer cell proliferation at day 3 with respect to cells exposed to ALA ($p < 0.01$) or HESW ($p < 0.001$) alone. An enhancement of necrotic and apoptotic cells was observed after the combined treatment with ALA and HESW E1 (3.1 and 6.4 fold increase vs. ALA alone) or E2 (3.4 and 5.3 fold increase vs. ALA alone).

Discussion: These findings are in agreement with our previous reports, indicating that shock waves have a sudden effect in enhancing cytotoxic activities of compounds defined as sonosensitizers in different cell lines.

Conclusion:

In conclusion, HESW may be proposed for the sonodynamic treatment of colon and liver cancer in in vivo animal model.