



Anti-Angiogenic Effect of Nutrient Synergy on Human Synovial Sarcoma Cell Line SW 982

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Abstract

Background:

Synovial sarcoma, a soft tissue cancer that most often occurs around leg or arm joints, has a 50% rate of metastasis. We investigated the synergistic effect of a unique nutrient formulation containing lysine, proline, arginine, ascorbic acid, and epigallocatechin gallate on human synovial sarcoma cells SW 982 by measuring: cytotoxicity, modulation of MMP-2 and -9, and cancer cell invasive potential.

Materials and Methods:

Human synovial sarcoma cells SW 982 (ATCC) were grown in DME medium supplemented with 10% FBS, penicillin (100 U/ml) and streptomycin (100 mg/ml) in 24-well tissue culture plates. At near confluence, the cells were treated with the nutrient formulation (NS) dissolved in media and tested at 0, 10, 100, 500, and 1000 µg/ml in triplicate at each dose. Cells were also treated with PMA 200 ng/ml to study enhanced expression of MMP-9. Cell proliferation/cytotoxicity was evaluated by MTT assay, MMP expression by gelatinase zymography, and invasion through Matrigel.

Results:

NS showed no significant effect on synovial sarcoma cell growth up to a concentration of 500 µg/ml. Zymography demonstrated expression of MMP-2 and a very faint band of MMP-9 by uninduced human synovial sarcoma cells. PMA (200 ng/ml) treated cells induced MMP-9 expression, but at much lower degree than is found with other cell lines. The nutrient mixture inhibited the expression of both MMPs in a dose-dependent fashion with virtual total inhibition of MMP-2 at 500 µg/ml and MMP-9 at 50 µg/ml concentration. The invasion of human synovial sarcoma cells through Matrigel was significantly reduced at 500 µg/ml (79%) and totally inhibited at 1000 µg/ml concentration of the synergistically acting nutrient mixture ($p < 0.0001$).

Conclusion:

Our results suggest that NS is an excellent candidate for therapeutic use in the

treatment of synovial sarcoma, by inhibiting critical steps in cancer development, such as inhibiting MMP expression and invasion.

Comment:

Standard treatment of synovial sarcoma, a soft tissue with a high (50%) metastatic rate has met with poor results. In this study, we investigated the inhibitory effect of a unique nutrient mixture (NS) containing lysine, proline, arginine, ascorbic acid, and epigallocatechin gallate on metastatic potential of human synovial sarcoma cells SW 982, by measuring MMP expression and Matrigel invasion in cell culture. We found NS to inhibit the expression of both MMP-2 and -9 in a dose-dependent fashion with virtual total inhibition of MMP-2 at 500 µg/ml and MMP-9 at 50 µg/ml concentration of NS. The invasion of human synovial sarcoma cells through Matrigel was significantly reduced at 500 µg/ml (79%) and totally inhibited at 1000 µg/ml concentration of the synergistically acting nutrient mixture ($p < 0.0001$). These results are important as they demonstrate that NS is an excellent candidate for treatment of synovial sarcoma by inhibiting critical steps in metastasis.