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Gamma-linolenic acid therapy of human glioma-a review of in vitro, in vivo, and clinical studies.

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Abstract

Gamma-linolenic acid (GLA) induced apoptosis of tumor cells without harming normal cells. Both cyclo-oxygenase (COX) and lipoxygenase (LO) inhibitors did not inhibit the selective tumoricidal action of GLA in some, but not all, tumor cells suggesting that GLA by itself is active. In contrast, anti-oxidants such as vitamin E blocked the tumoricidal action of GLA. GLA-treated tumor but not normal cells produced a 2-3-fold increase in free radicals and lipid peroxides. GLA decreased the anti-oxidant content of tumor cells, expression of oncogenes ras, and Bcl-2, enhanced the activity of p53, protected normal cells and tissues from the toxic actions of radiation and anti-cancer drugs, enhanced the cytotoxic action of anti-cancer drugs and reversed tumor cell drug resistance. In the animal glioma model, GLA induced tumor regression and preserved the surrounding normal brain tissue. In three open-label clinical studies, intra-tumoral injection of GLA induced significant reduction of glioma without any significant side effects. The low neurotoxicity of GLA to normal brain neurons and selective activity against tumor cells suggests that it could be an effective anti-glioma molecule.

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