Curcumin Confers Radiosensitizing Effects on Mcf-7 Breast Cancer Cells

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urcuminoids are a group of phenolic compounds isolated from the rhizome of Curcuma longa with various pharmacological properties. Studies have indicated that anti-cancer action of curcuminoids are attributed to their ability to induce apoptosis and cell cycle arrest but mechanisms of their action remain unexplained. Present work was designed to study the effects of curcumin and ionizing radiation on breast cancer cell line MCF 7. Incubation of cells treated with 100µM of curcumin for increasing time resulted in progressive reduction in cellular viability as examined by MTT. Subjecting cells to increasing doses of y radiation showed decreased survival as measured by MTT. Typically, a dose of 5 Gy reduced the survival to 52 % 96 hr after irradiation. The combined treatment of cells with curcumin and radiation produced substantial synergistic toxic effects. Treatment of cells with 5µM curcumin followed by irradiation at 5Gy reduced survival of cells to 38%. Analysis of results after staining with PI and annexin V showed induction of apoptosis by these treatments. The induction of apoptosis after 24 and 48 hr over the untreated population was 9 and 13% compared to that by curcumin alone

(18.7 and 19.2%). The combination of radiation and curcurmin significantly enhanced the magnitude of apoptosis in these cells after 24 hr (24 %) and 48 hr (34 %) of treatment. The induction of apoptosis was further verified through cell cycle analysis by PI staining . An increase in the sub G1 phase was observed when curcumin was treated in combination with radiation. Exposure of cells to gamma radiation induced ROS as determined by dichlorodifluoro diacetate,a fluoresecence probe. Treatment of the cells with curcumin prior to radiation yielded reduced ROS. These results suggest a possibility of ROS independent pathway for the radiosensitizing effect of curcumin on MCF. To elucidate the mechanism through which these effects were mediated the expression levels of NF-kB were assessed through gel shift assay. Curcumin down regulates NF-kB levels activated via radiation. Thus suggesting acts through overcoming the effects of radiation induced prosurvival gene expression. Further investigations have shown the involvement of signaling factors in the mechanisms of radiosensitization by curcumin as measured by by clonogenic and biochemical assays

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Dr Kaushala Prasad Mishra joined BARC in 1969 through 12th Batch of BARC Training School in Chemistry after completing Master of Science in Chemistry from Allahabad University in 1968. He did his Ph.D. from Gujarat University on Mangnetic Resonance studies on normal and irradiated biological systems. Currently, Dr Mishra is the Head, Radiation Biology and Health Sciences Division, BARC. His field of research spans radiation biology, free radical biology and biophysical studies on biological systems. Dr Mishra has made significant contributions in the area of

radiation science. He has published more than 100 research papers in National and International Journals and has delivered almost equal number of invited talks, including keynote lectures and inaugural addresses in National and International Conferences. More recently, focus of his research has been on the role of ROS in oxidative stress induced apoptotic cell death relevant to radioprotection and cancer radiotherapy. He has edited a book titled Radiobiology and Biomedical Research. He has contributed more than 15 Chapters in Books published by national and International publishers. Together with his colleagues, Dr Mishra has designed and developed a Cell Electroporator for biomedical research and applications, which is under Technology Transfer from BARC. He is a recipient of Distinguished Science Service Award of Asia Pacific EPR Society in 2004. Dr Mishra is a Guest Faculty member in several Universities/Institutes of India. He is on Editorial Board of International Journal of Low Radiation. He is also a Member of the International Advisory Board of Iranian Journal of Radiation Research. He was invited as Visiting Scientist to several Universities/Institutions in India and abroad.