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THE ANTICANCER PROPERTIES OF VITAMIN C: *IN VITRO* UPDATE

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Background: Vitamin C (ascorbic acid) is an essential nutrient with a number of beneficial functions, for the organism, among which it is worth mentioning its antioxidant activity and its role in the synthesis and stabilization of collagen. The anticancer/anti leukemic properties of Vitamin C are also known since at least 1969, even though the interest in Vitamin C as a potential anticancer molecule has only recently revived, thanks to experiments performed on human tumour cell lines *in vitro*.

Material and Methods: We used human tumour cell lines derived from retinoblastoma (Y79), uveal melanoma (C918, and OCM1) and human myeloid leukaemia (HL60, K562, U937, NB4, Nb4-R1, and NB4/As) exposed to different concentrations (in the order of magnitude of the millimoles) of the sodium salt of Vitamin C (sodium ascorbate). To evaluate cell viability before and after exposure to Vitamin C (sodium ascorbate), we used a standard flow cytometer and morphological/cytochemical methods, to further characterize the biological events produced by the exposure to the nutrient.

Results: All the cells used in our experiments showed apoptosis, autophagy, autschizis, and still other forms of cell death degeneration after 1-2 hours exposure to millimolar concentrations of Vitamin C (sodium ascorbate). The apoptotic/cytotoxic effect of Vitamin C showed a peak at around 3 millimoles although Y79 cell lines appeared to be more sensitive than the rest of the cell lines tested.

Discussion: There are at least seven different pathways, through which Vitamin C in high concentration may be cytotoxic for cancer cells. The most commonly accepted cause of cell death, after exposure to millimolar concentrations of Vitamin C is considered the production of H₂O₂, consequent to the oxidation of the nutrient to dehydroascorbate (DHAA) and subsequent reduction to ascorbate, but other mechanisms, such as the downregulation of hypoxia inducible factor (HIF) are also involved.

In this experience with a variety of human tumour cell lines, we have showed that Vitamin C kills very efficiently different cancer cell, *in vitro*, being, at the same time, completely harmless for normal cells. The data reported herein imply that Vitamin C in high concentrations, such as those that can be reached by intravenous injection of the nutrient, represents a very promising, natural molecule in the routine treatment of different cancers.

Biography

Domenico Mastrangelo has completed his degree in Medicine and Surgery on October 26th, 1979, at the age of 24. He then specialized in Haematology in 1983 Oncology in 1987, Clinical Pharmacology in 1990 and Ophthalmology in 2010. His experience is in the fields of hematological/oncological epidemiology and laboratory, cell biology, molecular biology. He published more than 100 papers in reputed scientific journals, including chapters in highly reputed scientific books in the fields of ocular oncology, clinical oncology, cancer cell biology, and hematology. He is presently Senior Scientist at the Department of Medical, Surgical, and Neurological Sciences of the University of Siena, Italy.

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